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DRAFT ENVIRONMENTAL IMPACT STATEMENT

F-15E Beddown at Seymour Johnson AFB, North Carolina

March 1988

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The Air Force proposes to convert the 72 F-4 aircraft at Seymour Johnson AFB with 72 LANTIRN equipped F-15E aircraft. The replacement would begin in January 1989 and be completed by 1991. The action would not result in an increase in overall sorties at the base, but would increase the number of operations currently flown between sunset and 1030 PM from five up to eighteen per day. There would also be an increase in the number of sorties flown on selected military training routes and in the percentage utilization of total available hours at the Dare County Range.

Alternatives considered included taking no action, delaying the action, constructing a new base, and using an existing base. (Cannon AFB, NM, Holloman AFB, NM, Mountain Home AFB, ID, and Nellis AFB, NV). The primary environmental concern associated with the proposed action is the effect of noise around Seymour Johnson AFB. The acreage impacted by Day-Night Noise levels of 65 decibels and above would increase by 37 percent, thus returning the area to a noise environment similar to the 1985 time period when 96 F-4 aircraft were assigned to the base.

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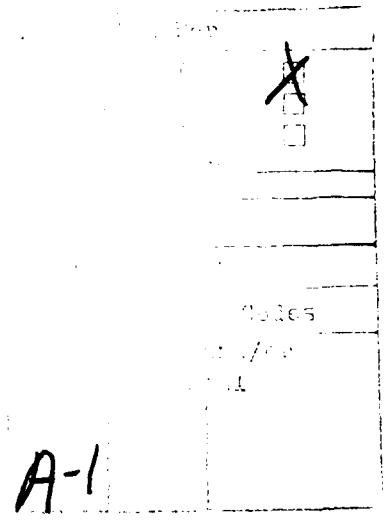
North Carolina



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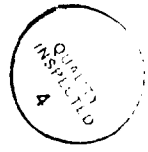

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(b) Proposed Action: Conversion of F-4 to F-15E aircraft that will be equipped with the new Low Altitude Navigation and Targeting Infrared for Night (LANTIRN) system at Seymour Johnson AFB, Wayne County, North Carolina.

(c) Responsible Individual: Alton Chavis, HQ TAC/DEEV, Langley AFB, VA 23665-5542; Telephone (804) 764-7844.

(d) Designation: Draft Environmental Impact Statement (DEIS).

(e) Abstract: The Air Force proposes to convert the 72 F-4 aircraft at Seymour Johnson AFB with 72 LANTIRN equipped F-15E aircraft. The replacement would begin in January 1989 and be completed by 1991. The action would not result in an increase in overall sorties at the base, but would increase the number of operations currently flown between sunset and 10:30 P.M. from five up to eighteen per day. There would also be an increase in the number of sorties flown on selected military training routes and in the percentage utilization of total available hours at the Dare County Range. The action would not require any modification to existing airspace and would not result in cumulative effects from other federally proposed activities in eastern North Carolina.

Alternatives considered included taking no action, delaying the action, constructing a new base, and using an existing base. (Cannon AFB, NM, Holloman AFB, NM, Mountain Home AFB, ID, Nellis AFB, NV, and Seymour Johnson AFB, NC were evaluated.) The preferred alternative is to make the conversion at Seymour Johnson AFB.

The primary environmental concern associated with the proposed action is the effect of noise around Seymour Johnson AFB. The acreage impacted by Day-Night Noise levels (DNL) of 65 decibels and above would increase by thirty-seven percent, thus returning the area to a noise environment similar to the 1985 time period when 96 F-4 aircraft were assigned at the base. Noise levels on the military training routes are expected to be reduced since the F-15E is quieter than the F-4 in cruise power. The noise environment at the Dare County Range is not expected to materially change. A small reduction in air pollutant emissions around the base and on the military training routes is expected.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACEE	Aircraft Air Pollution Emission Estimation
AFB	Air Force Base
AFR	Air Force Regulation
AFRES	Air Force Reserves
AGL	Above Ground Level
AICUZ	Air Installation Compatible Use Zone
ANG	Air National Guard
ANCLUC	Airport Noise Control and Land Use Compatibility Act
APZ	Accident Potential Zone
AQAM	Air Quality Assessment Model
CHABA	Committee on Hearing, Bioacoustics, and Biomechanics
CO	Carbon Monoxide
COHb	Carboxyhemoglobin
CUD	Compatible Use District
dB	Decibel
dB(A)	A-Weighted Sound Pressure Level
DCR	Dare County Range
DNL	Day Night Average Sound Level
DOD	Department of Defense
DOPAA	Description of Proposed Action and Alternatives
DOT	Department of Transportation
EA	Environmental Assessment
EIS	Environmental Impact Statement

EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FLIR	Forward Looking Infrared
Hb	Hemoglobin
HC	Hydrocarbons
HUD	Department of Housing and Urban Development
IR	Instrument Route
LANTIRN	Low Altitude Navigation and Targeting Infrared for Night
LASER	Light Amplification by Simulated Emission of Radiation
MOA	Military Operations Area
MSL	Mean Sea Level
MTR	Military Training Route
NAAQS	National Ambient Air Quality Standards
NHP	Natural Heritage Program
NM	Nautical Mile
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
O_2	Oxygen
O_3	Ozone
PM	Particulate Matter
PSD	Prevention of Significant Deterioration
PTS	Permanent Threshold Shift
psf	Pounds Per Square Foot

SEL	Sound Exposure Level
SHPO	State Historic Preservation Office
SN	SAE Smoke Number
SO_2	Sulfur Dioxide
SO_x	Oxides of Sulfur
TAC	Tactical Air Command
TDS	Total Dissolved Solids
TFS	Tactical Fighter Squadron
TFW	Tactical Fighter Wing
TSP	Total Suspended Particulates
TTS	Temporary Threshold Shift
TTW	Tactical Training Wing
USAF	U.S. Air Force
USFWS	U.S. Fish and Wildlife Service
VA	Veterans Administration
VR	Visual Route
VRD	Vision Restricting Device

SUMMARY

SUMMARY

The Air Force is proposing to convert 72 F-4s to 72 F-15E aircraft that will be equipped with the new Low Altitude Navigation and Targeting Infrared for Night (LANTIRN) system at Seymour Johnson Air Force Base (AFB). These aircraft would be phased in by 1991 with the replacement of a like number of F-4Es. The proposed action would not result in an increase in overall sorties at the Base, but would effect a substantial shift from daylight operations into the period between sunset and 2230 hours. There also would be an increase in the number of low level flights on selected Military Training Routes (MTRs), and in the percentage of utilization of the total available hours at the Dare County Range (DCR). This Draft Environmental Impact Statement addresses the potential impacts of this proposed action.

The potential direct impacts of the proposed action are assessed by comparison with 1986 baseline conditions. The 1986 characteristics reflect reductions in operations and personnel brought about by the 1985 deactivation of a squadron of F-4s with an associated loss of 700 military authorizations. The proposed action would increase the 1986 military authorizations by 220 people and thus help to offset the loss resulting from the F-4 squadron deactivation. Although the 1985 F-4 squadron deactivation occurred previous to the established baseline conditions, the effects of that action are considered in this assessment in order to evaluate the cumulative effects of past, current and proposed actions.

No future action has been identified that would provide a basis for analysis of additional cumulative impact.

The noise generated at Seymour Johnson AFB and vicinity would be affected by two factors associated with the proposed F-15E beddown. The F-15E is a quieter aircraft and would require less use of afterburners during takeoffs than the F-4 aircraft it would replace. These factors would reduce the amount of area affected by high noise levels of 80 decibels (dB) and above, but would increase the amount of area around the Base that would be affected by lower noise levels. On a short term basis, acreage impacted by noise would increase about 37% (approximately a 1.4 dB increase in overall noise). On a long term basis (cumulatively), the proposed action would result in a noise environment (acreage-wise) similar to the 1985 time period when 96 F-4 aircraft were assigned to Seymour Johnson AFB.

There would be a reduction in the utilization of Echo Military Operations Area for air-to-air missions as a direct effect of the beddown. However, this effect could be offset by possible rescheduling actions by other Bases utilizing this airspace.

The utilization of MTRs would increase by 34 percent and would be dispersed primarily over 10 existing MTRs extending through mountain, piedmont and coastal counties. Due to this dispersion and the fact that the F-15Es would

replace a more noisy aircraft, the proposed action would result in a small reduction in the expected noise levels along the MTRs.

The proposed action could increase DCR utilization from a 78 percent current rate to a 94 percent rate, depending upon the availability of alternative ranges. A shift in the operational emphasis to more nighttime sorties could result in longer operation of the range and would extend the time that the range and surrounding environments would be affected. The range would continue to be a high noise level environment.

Analysis of the socioeconomic impacts focused on changes in local economic conditions and the impact of changes in noise levels on residential property values. The results suggest a net positive impact on the local economy and essentially no net impact on residential property values. The increase from the baseline economic conditions in manpower, equipment, and construction activity would generate a significant increase in wages, salaries, production, and employment for Goldsboro, Wayne County, and the State of North Carolina. Specifically, production in Wayne County would be higher by $13.3 million dollars over baseline conditions, focused primarily in the construction, wholesale and retail trade, real estate and utility industries. Total employment in Wayne County would increase by 300 persons by 1991, split between the Air Force base and Goldsboro community. With respect to the impact of noise on residential property values, the effects would be minimal.

No impact on aircraft accident potential in the local area of Seymour Johnson AFB is expected from the proposed action. The total number of sorties would not materially change, but a larger percentage of them would occur at night, i.e. after sunset. Night flying operations inherently involve a higher accident risk potential. Well established nighttime procedures and prior training at Seymour Johnson AFB in night flying operations would minimize the risks of local night operations. However, the proposed action would result in an unavoidable increase in the potential for aircraft accidents during the night low-level and night surface attack elements of the new F-15E mission. Because the proposed action involves a new role, no existing F-15E accident history is available to quantify the predicted increase in accident potential. Based upon the accident history of the F-4, however, only a slight increase over the current potential is anticipated on the range and along the most affected MTRs. A carefully formulated training syllabus, effective simulator training, the two-man F-15E crew, and the already established night surface attack range procedures should minimize the accident potential for night low-level navigation and night gunnery range operations. A reduction in daytime air traffic congestion as a consequence of the F-15E LANTIRN mission would offset the inherent risks at the Base itself. This reduction in daytime air traffic congestion is even more significant when viewed in the context of Base operations prior to the 1985 deactivation of the additional F-4 squadron.

The use of lasers that would be associated with LANTIRN operations presents potential safety and health hazards. Use of the LANTIRN laser would be restricted to operations on approved ranges (i.e., DCR). Procedural recommendations have been developed to protect range personnel from direct and

reflected laser rays, and aircrews from rays reflected back to the aircraft from specular targets. Compliance with these procedures will prevent adverse impacts to the health and safety of either range personnel or aircrews. Ground reflection in the vicinity of the DCR is not considered to be a significant factor.

A small reduction in air pollutant concentrations attributable to aircraft flight operations at Seymour Johnson AFB would occur as a direct effect of the F-15E beddown and the departure of a like number of F-4 aircraft. Since the region is an area in which air quality is considered better than required by the National Ambient Air Quality Standards, there will be no change in that status.

At the DCR and for those MTRs currently utilized for F-4 operations, the proposed action would result in small reductions in air pollutant concentrations. For those areas not currently utilized by F-4s, air quality impacts would not be significant due to the dispersion of LANTIRN operations over an increased number of MTRs and airspaces. Any incremental increase in pollutants would be slight in any one area.

The proposed action should have no significant impact on either the physical or the biological environment of Seymour Johnson AFB. The indigenous vegetation and wildlife have been previously disturbed as a result of urban and agricultural development near the Base. Because there will be a small reduction in air pollutants at the Base and DCR, and the incremental increase that could occur in some MTR areas would be slight, there will be no significant impact on either indigenous or cultivated vegetation or archaeological sites in the vicinity of the Base, range, or MTRs. In addition, the turbulence from increased low-level flights should not affect standing archaeological structures.

Despite the studies on the effects of noise on domestic and natural animal behavior, there is no concensus regarding impacts. However, the preponderance of literature suggests that animal populations in general should not be impacted as a result of the proposed action. Studies also have shown that noise from low-level subsonic and high altitude supersonic flights are not likely to jeopardize the existence of raptors, such as the Peregrine Falcon in the vicinity of the range and MTRs. In consideration of these results, and the fact that no supersonic flights would be scheduled over land areas as a result of the proposed action, no significant biological impact due to noise is anticipated.

The only other possible impact at DCR, and to a lesser degree at Range BT-11, would be the unlikely occurrence of an uncontrolled fire. Although no flash-producing ordnance would be used during the high fire potential season, fire could be a consequence of a direct hit of the infrared targets by a practice bomb and the ignition of fuel spilled onto the ground. Since a peaty ground cover exists in these areas, a fire caused by the destruction of an infrared target could spread rapidly, burn extensively beneath the surface, and be difficult to extinguish.

There would be no adverse impact on water resources as a result of the proposed action. The projected addition of approximately 876 individuals (military, dependents, and secondary employment) represents a net decrease of 1,910 individuals as compared to the Base population before the 1985 F-4 squadron deactivation. The demand for water use at the Base would remain well below potential withdrawal rates and below past usage. Wastewater discharge rates for the Base would remain within the design capacity of the Goldsboro wastewater treatment plant.

Because of the industrial nature of the operations at Seymour Johnson AFB, the aesthetic values of the Base are unlikely to be adversely impacted by the proposed action. The aesthetic quality of areas in the vicinity of DCR and the proposed MTRs could be affected by the proposed action. The principal effect would be increased noise in the evening hours resulting from a greater number of early evening and nighttime sorties. However, the public frequently utilizing areas near DCR have been exposed to aircraft noise for a number of years. LANTIRN sorties would utilize existing MTRs at currently approved altitudes. These routes are selected to avoid populated areas and MTR operating instructions specify noise sensitive locations. Therefore, strict adherence to route widths and operating instructions should serve to minimize any aesthetic impacts from noise.

1.0 PURPOSE AND NEED

1.0 PURPOSE AND NEED

1.1 Purpose

The U.S. Air Force (USAF) proposes to beddown the F-15E at Seymour Johnson Air Force Base (AFB), North Carolina beginning in FY 89/2 (January 1989). The purpose of this proposal is to establish an F-15E operating location for beddown of the first combat-coded (wartime-capable) F-15E aircraft. The F-15E mission would encompass both air-to-air and air-to-ground operations, with emphasis on long-range, all-weather surface attack. The F-15E would utilize the Low Altitude Navigation and Targeting Infrared for Night (LANTIRN) system, allowing tactical employment under cover of darkness. The proposed beddown would result in a one-for-one replacement of F-4 aircraft presently based at Seymour Johnson AFB.

1.2 Need

In February 1984 the Department of Defense announced selection of the McDonnell Douglas F-15E as the "Dual Role Fighter." The aircraft fulfills a USAF requirement to replace aging F-4s and to augment F-111s in an air superiority and deep interdiction role. The F-15E is a highly modified, two-seat version of the F-15 air superiority fighter, featuring advanced avionics, conformal fuel tanks for extended range, an expanded weapons capacity, and LANTIRN for enhanced night operations. Procurement of 392 F-15Es is required to address two problems. One is a growing shortfall in deep strike capability as the F-4 and F-111 inventories drawdown due to retirement and attrition. The F-4 and F-111 have been in service over 20 years, and final USAF procurement was made 12 years ago. The other is to balance an enemy offensive air structure which continues to improve in both quantity and quality. Adding the F-15E to the tactical fighter force enhances our war fighting capability by preserving our ability to carry the war to the enemy, and by replacing outdated equipment with modern, more capable systems. A beddown location with proper facilities and a range/airspace package compatible with operational training is essential to build and sustain an effective combat force. Failure to establish an F-15E operational location would deny the USAF much needed improvements in adverse weather and deep interdiction capabilities.

The development of the LANTIRN fire control system evolved from recent rapid advances in forward looking infrared (FLIR) sensors, lasers, digital processing, terrain following radar, and target recognition technologies. LANTIRN provides aircraft such as the F-15, F-16, and A-10 with a low altitude, day/night, under the weather air-to-ground capability.

The system consists of a navigation pod and a targeting pod. The navigation pod contains a terrain following radar and wide field of FLIR, which is displayed on a head-up display screen, giving the pilot a night window. The targeting pod contains a large aperture targeting FLIR, laser designator/ranger, automatic tracker, automatic MAVERICK hand-off capability, and growth provisions for an automatic target recognizer. These capabilities permit the pilot of a single or dual seat aircraft to deliver guided and

unguided weapons under day/night, low altitude conditions using highly survivable standoff tactics.

The principal functions of the navigation pod are FLIR imagery for navigation and radar for terrain following, obstacle avoidance, and under-the-weather flying. In its normal operating mode, the terrain following radar subsystem uses radar emissions to the ground and their return to allow the pilot to fly manually at a preselected 100 to 1000 feet above the ground level. The subsystem consist of a Ku-band radar made up of a 10-inch diameter antenna, transmitter, two-channel receiver, and signal processor. High electronic countermeasures resistance is achieved through the combination of high peak power, modified command algorithms, and mode changes. The fixed imaging navigation sensor subsystem uses variations in infrared energy emissions from ahead terrain which, after processing, are used to develop a video image projected on the head-up display. The navigation pod also contains a computer, a power supply and an environmental control system that is shared by the two functional subsystems.

The targeting pod permits day or night precision delivery of conventional, laser guided bomb, and electro-optical weapons. The principal functions of the targeting pod are to allow the pilot to acquire and automatically track targets for laser guided bomb and conventional munitions delivery, laser designated for laser guided bomb delivery, and detect, acquire, recognize, and prioritize targets for automatic handoff to infrared MAVERICK. The targeting pod is divided into three major sections. A nose section contains the forward looking infrared and laser optics, forward looking infrared electronics, and laser transmitter/receiver. A center section contains a power supply, central electronics unit, laser synchronizer and range computer, pod control computer, and missile boresight correlator. An aft section contains the environmental control unit.

A typical laser guided bomb mission utilizes a low level ingress to the target with the aid of the navigation FLIR, terrain following radar, and accurate inertial navigation system cuing to the target area. At the target area, a computer calculated release point weapon delivery mode allows the pilot to loft the laser guided bomb. The inertial navigation system cues the target pod line of sight toward the target and, when the target is unmasked, the pilot removes system cuing error by slewing the line of sight and engaging the automatic point tracker. The steering line on the head-up display shows the heading for bomb delivery and the time to execute the pull-up maneuver. As the solution cue appears on the bomb fall line, the pilot executes the pull-up maneuver. The bomb is automatically released at the proper time if the weapon release switch is depressed. After bomb release, the pilot executes a breakaway maneuver. Using the wide field-of-view head-up display FLIR scene, snap look, and terrain following symbol, the pilot exits the target area. At the same time, the target is automatically tracked for laser designation and at the proper time is automatically lased to maximize the accuracy of the laser guided bomb delivery.

The laser targeting portion of the LANTIRN system will not be used on targets off the bombing range. However, the navigation pod will be used throughout the training flight.

The Base selection process for a new beddown must consider factors which vary according to the nature of the mission. For example, a training mission requires academic and simulator facilities, whereas an operational mission requires munitions and mobility facilities. Range and airspace requirements also vary depending on mission. A training unit should control their training areas to ensure an uninterrupted student training schedule. Conversely, an operational unit is more concerned with areas which allow realistic training. Overall force programming may be an overriding factor by eliminating Bases which are already scheduled for conversion or which must maintain their present mission for an extended period.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

Tactical Air Command (TAC) proposes to beddown 72 Primary Aircraft Authorization combat-coded F-15E aircraft at Seymour Johnson Air Force Base (AFB), beginning in FY 89/2. The F-15E mission would emphasize air-to-ground employment while retaining a full air-to-air capability, with a mission mix of 80% air-to-ground and 20% air-to-ground/transition. This contrasts with F-15A/B/C/D training, which is 80% air-to-ground and 20% air-to ground/ transition. Monthly aircraft utilization rates would remain at current levels. Coinciding with the build of F-15E aircraft would be an offsetting reassignment of a like number of F-4Es.

Table 2.0-1 provides an overview of aircraft assigned, and changes in manpower as a result of F-15E beddown. Data shown are for the 1986 baseline (a time period adopted as a point of reference in this environmental analysis), and the proposed action (preferred alternative). The F-15E beddown would increase Base manpower authorizations by 220 people. This would help offset (replace) some of the 700 authorizations lost when a squadron of F-4s was deactivated in FY 85.

The F-15E performance and operating characteristics would be similar to earlier F-15 versions as regards emissions, noise and terminal airspace use. Engine improvements concentrate on reliability, with no changes in thrust output. A slight increase in the number of afterburner takeoffs may be required (especially in the summer months) due to the higher gross weights associated with the F-15E. Ground engine maintenance runs and pre-takeoff engine checks would be unchanged.

Local airspace operations, such as departures, arrivals, and practice approaches at the end of a training mission, would remain the same. There would be no significant change in the total number of sorties occurring in the 6 A.M. to 10 P.M. time period; however, due to Low Altitude Navigation and Targeting for Night (LANTIRN) operations, up to 18 sorties per day could occur between sunset and 10 P.M. (worst case). It is projected that up to three aircraft landings could occur after 10 P.M.; this would be an increase of 2.5 sorties/day (a sortie is taken to be the combination of a takeoff and a landing) over the current condition. Seymour Johnson AFB does not plan to change its "Quiet Hour Policy" (which restricts operations beyond 10 P.M. to mission essential operations only) because it is believed normal operations could continue to be completed before the quiet hour.

The F-15E would utilize all categories of airspace controlled by the 4th Tactical Fighter Wing (TFW), with emphasis on low-level routes and restricted airspace for tactical maneuvering. Seymour Johnson AFB controls four Military Training Routes (MTRs) with access to numerous other instrument (IR) and visual (VR) routes. (See Table 2.0-3 for a list of typical MTRs that could be used by the F-15E.) Sortie data shown in Table 2.0-2 were obtained from each particular route's schedule. The data represent a composite of all activity

(Air Force, Navy, Marine, and Air National Guard) scheduled for the routes. It is emphasized that the data do not reflect actual flights because scheduled flights can be cancelled due to weather, mechanical difficulties, or other reasons. Data on schedules are used in this document because the various scheduling agencies do not maintain records of actual sorties. Sortie estimates for the proposed action are made assuming that other services' activity remains constant. The daily sortie rate would remain the same over the 1986 baseline; however, F-15E beddown would result in a 34% increase in overall MTR utilization (Table 2.0-3).

Daytime use of MTRs would decrease from the F-4 average of 25 sorties per day to 22 sorties per day for the F-15E, while night use (sunset-2200) would increase from the current 3 sorties per day to 14 per day. With over 30 low-level routes within 200 miles of Seymour Johnson AFB, this increase in sorties should not present a significant problem. The sunset-2200 sortie estimates are worst case and may be significantly lower if Vision Restricting Devices (VRD) are adopted for use in the F-15E. VRDs would permit night training events to be accomplished during daylight hours.

LANTIRN training would necessitate both lower operating altitudes along the MTRs and increased night operations. LANTIRN requirements for an effective low-level sortie dictate a route length of 150 to 300 NM. Individual route segments should be long enough to allow a minimum of 15 minutes and a maximum of 45 minutes flight time at a given altitude. Desired minimum route altitude is 100 feet Above Ground Level (AGL); however, anticipated flight at that altitude would comprise only 20 percent of total operations. Further, it is estimated that 30% of total low-level operations would be conducted at 300 feet AGL, and the remaining 50% at 500 feet AGL and above.

The longer range capability of the F-15E (in comparison to the F-4) would significantly increase the number of MTRs available for low level training. The 30+ VR and IR low level routes available to Seymour Johnson aircraft offer a wide variety of terrain for realistic training, ranging from coastal plains to mountains. The ten MTRs shown in Table 2.0-2 are a combination of routes currently utilized by Seymour Johnson AFB F-4 aircraft and routes which are most likely to receive increased utilization by F-15E aircraft.

Other airspace used to train 4 TFW aircrews includes: airspace over the Dare County Range (DCR); Echo Military Operations Area (MOA), Gamecock MOA, W122A/B/C, W177A/B, and associated Air Traffic Control Assigned Airspace. Of these areas, the airspace and range combination most frequently used by the F-15E would be DCR and W122A/B/C. Airspace requirements for air combat training would be reduced by 48% from current levels.

Overall requirements for conventional and tactical ranges would increase, with the F-15E flying 80% of its training sorties as air-to-ground missions compared to 67% for the F-4. Air-to-ground training would continue to be conducted on Air Force DCR. Limited activity at same levels as current operations could continue to be flown on Navy DCR, BT-9 and BT-11 Ranges near Cherry Point and Poinsett Range near Shaw AFB. Night range requirements (sunset-2200) would

TABLE 2.1-1

AIRCRAFT AND MANPOWER

AIRCRAFT ASSIGNED

	FY 86/4	FY 88/4	FY 89/4	FY 90/4	FY 91/4
F-4E	72	72	42	12	-
F-15E	-	-	30	60	72
TOTAL	72	72	72	72	72

MANPOWER DELTA

	FY 88/4	FY 89/4	FY 90/4	FY 91/4
Officer PPE[1]	0	1	3	4
Enlisted PPE	0	63	126	189
Civilian PPE	0	0	0	0
Officer BOS[2]	0	0	1	1
Enlisted BOS	0	6	12	18
Civilian BOS	0	3	5	8
TOTAL	0	+73	+147	+220

NOTE: 4 TFW had 96 F-4 aircraft assigned FY 83 - FY 85. FY 91 manpower would be 476 less than that assigned in FY 84.

1 PPE - Primary Program Element
2 BOS - Base Operational Support

TABLE 2.1-2

MILITARY TRAINING ROUTE UTILIZATION

(ANNUAL)

ROUTE	MINIMUM ALTITUDE (FT)	BASELINE (SORTIES)	PROPOSED ACTION (SORTIES)
VR-073	100	2928	3278
VR-1074	100	4310	4890
IR-012	500	372	446
VR-058	100	276	314
IR-721	300	576	656
VR-096	500	564	639
VR-1752	SFC	1502	1682
VR-1753	500	2434	2772
VR-1043	200	868	988
VR-1046	200	1389	1667

TABLE 2.1-3

OPERATIONAL CONSIDERATIONS

ITEM	BASELINE	PROPOSED ACTION
Aircraft Authorizations	72	72
Sorties/Day	60	60
Sunset - 2200 hr	5	18
After 2200 hr	0.5 (landings)	3 (landings)
- Military Training Routes		
0600-2200 hr	28	36
Sunset-2200 hr	3	14
After 2200 hr	0	0
- Dare County Range		
Percent Utilization	78	94

increase from the current 10% of total training sorties for the F-4 to 33% for the F-15E. Since activity levels at these sites will not change, the remainder of this document will deal with DCR. Therefore, day range requirements would decrease an average of one range period per day (assuming 30 minute periods), and night range requirements would increase by three periods per day. This increase could be accommodated by expanding the operating hours at Air Force DCR, and through additional utilization of Navy Dare and BT-11.

Since range availability and scheduling is done on an "hourly" basis rather than sorties, utilization is discussed in "percent available" terms. Table 2.0-3 shows 1986 baseline utilization of Air Force DCR is 78%, based on operating hours of 0630-2030 M-Th, and 0630-1530 Fri. If all additional F-15E range sorties were scheduled against DCR, utilization would rise to 94%. Actual utilization of Air Force DCR may be somewhat lower, since the 4 TFW schedules training missions to all the above listed ranges. The percent utilization of the other ranges would not materially change over ongoing or programmed actions. In addition, operating hours of Air Force DCR would likely be extended to accommodate F-15E night training requirements.

Infrared discernable targets would be required on the conventional and tactical ranges. Two infrared targets placed on the conventional range would allow for introduction to infrared weapons deliveries. For tactical ranges, a convoy of four to six vehicles and four to six individual targets representing petroleum storage facilities, power plants, etc., would be needed. Any new targets could be collocated with existing targets.

Beddown of the F-15E at Seymour Johnson AFB would necessitate some facility construction. Major projects include expanded squadron operations, a simulator facility, expansion of the present fuel cell shop, alteration of the aircraft hangers, avionics shop, engine shop, and additional parking apron.

2.2 Alternatives to the Proposed Action

The F-15E is a long-range, multi-purpose fighter aircraft intended to fill both air-to-surface and air-to-air roles. This weapon system has design features and capabilities which would significantly enhance the U.S. Air Force's (USAF) ability to conduct deep interdiction and air superiority missions in a severe threat environment. The F-15E is essential to our national security and should be deployed in accordance with objectives agreed upon by the Department of Defense and Headquarters, USAF. This would ensure accomplishment of the long-term force modernization program in a timely, orderly, and economical manner, and provide the most effective operational force possible. Alternatives in planning for establishment of an operational F-15E unit at Seymour Johnson AFB are discussed below.

2.2.1 No Action

Acceptance of the no action alternative would result in no major action taken to replace aging F-4 aircraft at Seymour Johnson AFB or to improve the capabilities of the current fighter force. The 4 TFW at Seymour Johnson AFB is the last combat-coded F-4 fighter-bomber unit in TAC. There is a present need to upgrade the 4 TFW to a newer, more capable aircraft. The F-15E is a long-range, multi-purpose aircraft with design features and capabilities that would significantly enhance the USAF's ability to conduct deep interdiction and air superiority missions. Failure to replace F-4 aircraft with F-15E aircraft at Seymour Johnson AFB would hinder accomplishment of the long-term force modernization program in a timely, orderly, and economical manner. No action is not a prudent alternative considering the need to replace the F-4 aircraft and replacement with LANTIRN equipped F-15E aircraft capable of operating at low altitude, night, and under-the-weather conditions would be a positive step toward the modernization program objective of providing the most effective operational force possible.

2.2.2 Delay Action

This alternative is not feasible considering the critical need for the capabilities of the F-15E, the need to upgrade the 4 TFW to a newer, more capable aircraft, and due to the procurement schedule for operational and training aircraft. Beddown of the F-15E training mission at Luke AFB has been programmed to coincide with that production schedule. To progress in a timely, organized and economical manner to meet the requirements stated above, a combat-coded F-15E wing must be based at a CONUS location. This alternative would only forestall any environmental consequences resulting from the beddown and is not responsive to requirements which ultimately support a national security requirement. This alternative will not be considered further.

2.2.3 New Base

This option is not feasible. Recent estimates of the cost to purchase land and construct necessary facilities approach one billion dollars. The allocation of the federal budget between governmental departments results in an austere

military budget which cannot provide for new Bases when existing facilities are available and largely adequate. In addition to the impractical cost, a minimum of five years would be required to acquire land, design, and construct a new AFB, thus causing an unacceptable delay in beddown of the first F-15E combat wing. This alternative will not be considered further.

2.2.4 Alternate Bases

For the most part, USAF Bases are operating at or near capacity. The current basing structure is a product of carefully matched operational requirements and available facility/training space resources. As a result, new beddowns are often constrained to Bases with similar equipment or missions. A total of 73 Bases in the continental United States were evaluated against the criteria in Section 2.2.4.1 for beddown of the first F-15E operational wing. A majority of these Bases were unsuitable for fighter aircraft beddown due to one or more of the following reasons: inadequate or lack of ranges/airspace/low level structure; presence of an existing mission programmed for long-term activity on the Base; inappropriate or gross facility inadequacies. Nineteen Bases were determined to be suitable for fighter aircraft beddown. Of these, Bergstrom, Davis-Monthan, Eglin, England, George, Hill, Langley, MacDill, Myrtle Beach, and Shaw have on-going missions which would be prohibitively expensive and programmatically disruptive to relocate. Moody and Homestead are currently in the conversion process to a new aircraft. Luke has been proposed as the training location for the F-15E and Tyndall is being expanded as an F-15 air-to-air training location. Five Bases were selected for final evaluation: Cannon AFB, NM; Holloman AFB, NM; Mountain Home AFB, ID; Nellis AFB, NV; and Seymour Johnson AFB, NC.

2.2.4.1 Criteria

The following requirements were primary considerations in evaluating candidate Bases for beddown of the F-15E operational mission:

a. Availability of air-to-ground weapons ranges capable of supporting both conventional and tactical training events. The F-15E can utilize ranges up to 300 miles from Base; however, ranges within 100 miles are optimum for most training flights. Ranges must be capable of accommodating night operations for LANTIRN training. "Night operations" will be conducted between the period from sunset to 10 P.M. to reduce environmental impact. Multiple targets are desired to absorb the anticipated larger number of one- and two-ship operations.

b. Availability of suitable low-level MTRs. Low level navigation and tactics training flights are generally conducted below 1000 feet altitude in route to a bombing range. The ability to operate as low as 100 feet will be required for 20 percent of the total low-level operations, and at 300 feet for approximately 30 percent of the operations. The remaining 50 percent can be accomplished at 500 feet and above. The F-15E/LANTIRN combination will also require that low-level operations be conducted during periods of darkness.

c. Availability of suitable airspace within 125 miles of Base to accomplish basic aircraft handling and advanced air combat training missions. Areas should permit supersonic operations. Access to an instrumented air combat tactics range is desirable due to the higher quality of training possible.

d. Appropriate facilities to accommodate both the aircraft and mission. First, the Base should be capable of absorbing this beddown using available facilities, and without moving the present mission. Relocating one unit to make room for another has a domino effect which results in excessive cost and undesirable personnel turmoil which must be avoided. Second, Base facilities should be oriented to fighter aircraft (squadron operations, aircraft maintenance units, munitions, forward supply areas). Third, facilities must be adequate to support a combat mission. For example, are mobility and munitions facilities available? Ideally, the new mission would replace a similar mission which is departing.

e. Compatibility with the present mission or with an action already programmed to occur at that location. Attempting to beddown a tactical fighter mission at a northern-tier bomber Base, or at a pilot training Base is not feasible due to the striking dissimilarities of the missions and support requirements. Likewise, a Base which is already programmed to receive a new mission or new aircraft does not warrant consideration because of the domino effect mentioned in paragraph 2.2.4.1d above.

2.2.4.2 Cannon AFB, NM

Cannon AFB supports the 27 TFW, with three squadrons of combat-coded F-111D aircraft. One squadron serves as a training unit for the F-111D, since that model has avionics which are unique in the F-111 inventory.

a. Cannon controls, and is the primary user of, Melrose Bombing Range, located 24 miles from Base. Melrose also has tactical targets and is being expanded to allow more flexibility in total range operations. Current utilization rate at Melrose is 68%. An additive beddown of operational F-15E aircraft would increase utilization to 108%, requiring use of other ranges. The current range operating hours of 0700-2200 M-Th and 0700-1800L Fri do not offer much capability to increase weekday operating hours. Oscura Range, under Army control, (165 miles, 71%), and Red Rio Tactical Range (156 miles, 51%), primarily support Holloman AFB, but could also be used by the F-15E. Fort Carson Range (Air National Guard, 260 miles), and Falcon Range (Air Force Reserve, 240 miles), are usable, but are at the edge of the F-15E training radius. These ranges can each support one flight at a time. The total range system available would support an operational F-15E beddown in either an additive or an offset situation.

b. Cannon controls three VR (day, visual flight only) low-level routes and six IR (night, all weather) low-level routes. All presently have route segments down to 100 feet AGL, and eight of nine could have those segments expanded. Night operations up to 10 P.M. are possible. In addition, seven

other MTRs are utilized by Cannon aircraft. The total MTR system available would support the proposed beddown.

c. Cannon utilizes the Pecos MOA, R5104, and R5105 for aircraft handling and air combat tactics training. An instrumented air combat training area is not available. Available airspace will support the proposed mission.

d. Cannon facilities are appropriate for fighter aircraft beddowns, but will be fully utilized by F-111 aircraft for the foreseeable future. Previous studies on assigning two additional F-111 squadrons to Cannon determined facilities cost to be approximately 50 million dollars. Overall, an excessive dollar outlay is required to accommodate an additive operational F-15E mission.

e. The F-15E operational mission would be compatible with the present mission at Cannon AFB. However, the F-111 mission is not scheduled to relocate, nor is there a Base currently capable of accepting an F-111 beddown without excessive construction cost. Overall, Cannon is mission-compatible, but programmatically unsuited for F-15E beddown.

2.2.4.3 Holloman AFB, NM

Holloman AFB supports the 49 TFW, with three squadrons of combat-coded F-15 aircraft; and the 479th Tactical Training Wing (TTW), with four squadrons of training-coded T-38 aircraft.

a. Holloman aircraft use Oscura Range, and Red Rio Tactical Range, located 50 miles and 73 miles from Base respectively. Oscura supports T-38 Lead-In Training for the 479 TTW, with a utilization rate of 71%. Beddown of the F-15E operational mission, whether to replace the air-to-air F-15s or in addition to them, would increase Oscura utilization to 92%. The F-15E could also use Melrose Range (145 miles, 68% utilization) as an alternate training site. Ranges and airspace are managed by the Army as part of the White Sands Missile Range, with test requirements causing frequent airspace denial. The total range system has the capacity, if not the greatest flexibility, to support an operational F-15E beddown.

b. Holloman controls two IR low-level routes, both with route segments down to 100 feet AGL and night operations authorized. Several other VR and IR routes leading to Melrose Range could also be utilized. The total MTR system available would support F-15E operational training.

c. Holloman controls the Beak, Cowboy, Talon, and Valentine MOAs. An instrumented air combat tactics range is available. Airspace scheduling is difficult due to conflicting requirements with White Sands Missile Range. If the present missions remain, the total available airspace would have limited flexibility in supporting an F-15E beddown.

d. Holloman facilities are appropriate for fighter aircraft beddowns, but are at full capacity with the missions presently assigned. An additive F-15E beddown could share many existing F-15 facilities, but the cost of new

construction would exceed $25 million. Overall, an excessive dollar outlay is required to accommodate an additive F-15E beddown.

e. The F-15E operational mission would be compatible with the present operation at Holloman AFB. However, the 479 TTW has a unique training mission which would be difficult and expensive to relocate. Likewise, there is no Base available to relocate a full F-15 combat wing. Overall, Holloman is mission-compatible but programmatically unsuited for F-15E beddown.

2.2.4.4 Mountain Home AFB, ID

Mountain Home supports the 366 TFW, with two squadrons of combat-coded F-111s, and one squadron of training-coded (assigned to a training squadron) F-111 aircraft. All three units have a training unit mission; one serves as the sole training unit for EF-111 electronic jamming aircraft.

a. Mountain Home controls, and is the primary user of, Saylor Creek Range, located 22 miles from Base. Current utilization is 70%, and would rise to 95% with the additive beddown of an operational F-15E unit. Other ranges available for use by Mountain Home aircraft are Eagle Range (175 miles), Wildcat Range (195 miles), Boardman Range (235 miles), and Fallon Range (240 miles). Each of these ranges can support one flight at a time. The total range system available would support an operational F-15E beddown.

b. Mountain Home controls five IR low-level routes, all of which are certified for 100 foot AGL and night operations. Numerous other VR and IR routes are available. The total MTR system available would support the proposed mission.

c. Mountain Home controls R3202, and the Owyhee, Paradise, Sheep Creek, Saylor, and Brunean 1/2 MOAs. An instrumented ACMI range is not available. The total airspace available would support the proposed action.

d. Mountain Home facilities are appropriate for fighter aircraft beddown, but will be fully utilized by F-111s for the foreseeable future. Previous studies on assigning a second wing to Mountain Home estimated facilities cost to be in excess of 50 million dollars. Overall, an excessive dollar outlay is required to accommodate an additive F-15E mission.

e. An F-15E operational mission would be compatible with the present mission at Mountain Home. However, the present F-111 mission is not scheduled to relocate, and moving the unique EF-111 training unit, with its electronic training range, would be especially difficult and expensive. Overall, Mountain Home is mission-compatible, but programmatically unsuited for F-15E beddown.

2.2.4.5 Nellis AFB, NV

Nellis AFB supports the 57th Fighter Weapons Wing, with seven squadrons of training/test aircraft (A-10, F-5, F-15, F-16); and the 474 TFW, with three squadrons of combat-coded F-16 aircraft. Nellis is also host to the on-going

Red Flag program comprised of the largest and most realistic training exercises in the free world.

a. Nellis controls the Nellis Range, with nine separate target areas located 45 to 120 miles from Base. Utilization varies from 87% to 99%, with an average of 93%. It is undoubtedly the most complete range area in the world; also the most heavily utilized. Crowding and airspace use conflicts are long-standing concerns for the Nellis complex. Given the current situation, an additive F-15E beddown is not feasible. Other ranges would be available to the F-15E: Twenty-Nine Palms Tactical Range (120 miles), Chocolate Mountain Range (180 miles), El Centro Tactical Range (220 miles), Yuma Range (230 miles), Fallon Range (245 miles), and the Utah Test and Training Range (270 miles). The total available range system could support an F-15E operational mission in an offset situation only.

b. Nellis controls four VR low-level routes and one IR low-level route, with various combinations of 100 foot AGL and night operations allowed. Numerous other VR and IR routes are available for use by Nellis aircraft. The total MTR system available would support the proposed mission.

c. Nellis controls the Desert MOA, and restricted airspace R4806 and R4808. An instrumented air combat range is available. Airspace is saturated at this time, with multiple using agencies having conflicting requirements.

d. Nellis facilities are appropriate for fighter aircraft. An additive mission beddown would require virtually a complete set of new support facilities.

e. The F-15E mission would be compatible with existing missions at Nellis. Range requirements would increase. Beddown of 72 F-15E aircraft at Nellis AFB, is discouraged considering the long-standing concerns over facility, airspace and range saturation at this location.

2.2.4.6 Seymour Johnson AFB, NC

Seymour Johnson AFB supports the 4 TFW, with three squadrons of combat-coded F-4 aircraft, and the 68th Air Refueling Wing, presently converting to KC-10 aircraft.

a. Seymour Johnson AFB controls DCR, located 105 miles from base. This range is utilized (78%) by air-to-surface units based on the east coast. Other ranges utilized by Seymour Johnson AFB are Navy Dare Range (adjacent to Air Force Dare), Poinsett (156 miles), BT-9 and BT-11 at Cherry Point (70 miles), and Stumpy Point (110 miles). Each range can support one flight at a time. An additive F-15E mission beddown would be difficult to accommodate within the existing range system. An offsetting F-15E mission would require expanding range operating hours at the DCR, however, the total range system available (and being used today) could support F-15E beddown.

b. Seymour Johnson AFB controls four VR low-level routes and no IR

low-level routes. All four routes provide capabilities down to 100 feet AGL and operations till 10 P.M. Numerous other VR and IR routes are available to Seymour Johnson AFB aircraft. The total MTR system available could support the proposed beddown.

c. Seymour Johnson AFB controls R5314 and the Echo MOA. Other airspace available for training includes W-122 and R-5306. There is an instrumented air combat tactics range available. The Echo MOA is being enlarged to provide a more suitable aircraft handling area near the Base. The total airspace system available would support the proposed mission.

d. Seymour Johnson AFB has appropriate facilities for fighter aircraft beddown. Moreover, the F-4 aircraft is nearing the end of its active duty service. Allocation of these aircraft to the reserve forces would make facilities available for F-15E beddown. Departure of the F-4 would make available several unique weapons system storage and maintenance facilities (PAVE TACK, ALQ-131 ECM Pods) for other F-15E requirements. Overall, an excessive dollar outlay would be required to accommodate an additive F-15E beddown. An offsetting beddown situation would be very attractive, since present facilities are already oriented to support a combat mission.

e. The F-15E operational mission is compatible with existing missions at Seymour Johnson AFB. An additive mission beddown would require an excessive dollar outlay to provide a complete set of support facilities. In addition, there currently is no Base capable of receiving a full-up F-4 combat wing without excessive construction cost. However, as the last F-4 fighter-bomber combat unit in the US, the 4 TFW is next in line to upgrade with new aircraft. Transfer of those F-4s to reserve forces would allow an offsetting beddown of F-15E aircraft/mission at Seymour Johnson AFB.

2.3 Preferred Alternative

Table 2.3-1 provides a summary of how the various alternatives compare in respect to the beddown criteria. The Seymour Johnson AFB beddown alternative is the most viable option, as transfer of F-4 aircraft to reserve forces would allow beddown of the F-15E as an offsetting, rather than an additive mission. Inactivation of the 474 TFW at Nellis would also allow an offsetting beddown. However, the increased airspace use conflicts and continued saturation situation which would result from F-15E beddown would be unacceptable. A beddown at other locations would result in a domino effect due to moving existing units to make room for the F-15E program. The domino effect could weaken the Tactical Air Force posture by adversely affecting future basing options. Thus, Seymour Johnson AFB is the USAF's preferred alternative.

TABLE 2.3-1

ALTERNATIVE BASES

	A-G Ranges	Low Levels	Airspace	Facilities	Program Compatible
Cannon	C	A	A	C	U
Holloman	C	A	C	C	U
Mountain Home	A	A	C	C	U
Nellis	C	A	C	C	U
Seymour Johnson	C	A	A	C	C

Legend: A - Acceptable
C - Conditional
U - Unacceptable

2.4 Summary of Environmental Effects

Table 2.4-1 graphically summarizes the environmental effects of the proposed action and alternatives.

TABLE 2.4-1

SUMMARY OF ENVIRONMENTAL EFFECTS OF
THE NO ACTION ALTERNATIVE AND THE PROPOSED ACTION

Impact Area	No Action Alternative	Proposed Action
Air Quality	0	+
Noise	0	-
Physical Environment	0	0
Biotic Resources	0	0
Aircraft Accident Potential	0	0
Laser Operations	0	0
Socioeconomics	0	+
Archaeological Resources	0	0
Aesthetic Impacts	0	0

Legend: + = Net improvement
0 = No significant change
- = Net deterioration

3.0 AFFECTED ENVIRONMENT
(Baseline Conditions)

3.0 AFFECTED ENVIRONMENT (Baseline Conditions)

Seymour Johnson Air Force Base (AFB) is located in the center of Wayne County, North Carolina near the City of Goldsboro (Figure 3.0-1). The Base is approximately 50 miles southeast of Raleigh, 60 miles northeast of Fayetteville, and 30 miles northwest of Kinston, North Carolina. The Base is situated in the coastal plain farming region, centrally located between the coast and piedmont regions of North Carolina.

The Echo Military Operations Area (MOA), outlined in Figure 3.0-1, lies over a land area of approximately 1200 square miles and includes the cities of Goldsboro, Clayton, Benson, and Clinton. The airspace is used to maintain the proficiency of experienced pilots in subsonic combat tactics. Overflights within the MOA airspace are limited to elevations between 7,000 to 23,000 feet MSL. Other airspace available for training includes W-122, R-5306, R-5314, W-177, and the Gamecock MOAs (Figure 3.0-2).

Dare County Range (DCR) is located in eastern North Carolina approximately 105 miles northeast of Seymour Johnson AFB. It lies on the southern mainland portion of Dare County. The western border of the range is the Alligator River. To the east and south is Pamlico Sound. Figure 3.0-3 shows the range location relevant to nearby geographic and topographic features. Other ranges utilized by Seymour Johnson AFB are Navy Dare Range (adjacent to DCR), Poinsett Range 156 miles from Seymour Johnson AFB near Sumter, South Carolina (under airspace R-6002, Figure 3.0-2), BT-9 and BT-11 at Cherry Point 70 miles from Seymour Johnson AFB (Figure 3.0-2), and Stumpy Point 110 miles from Seymour Johnson AFB and east of DCR (Figure 3.0-3).

Ten military training routes (MTRs) are expected to be used by the proposed F-15E operations. The MTRs, shown in Figure 3.0-2, cross coastal plain, piedmont, and mountain provinces, Pamlico Sound, and the North Carolina Outer Banks. The full extent of available MTRs range from northeastern South Carolina to southern Virginia. The westernmost MTR (VR-58) extends from western South Carolina to west of Chattanooga, Tennessee. The current and proposed distribution of low-level sorties over these MTRs is given in Table 2.0-3. Four of these MTRs provide existing low-level capabilities down to 100 feet AGL (VR-058, VR-073, VR-1074, VR-1752).

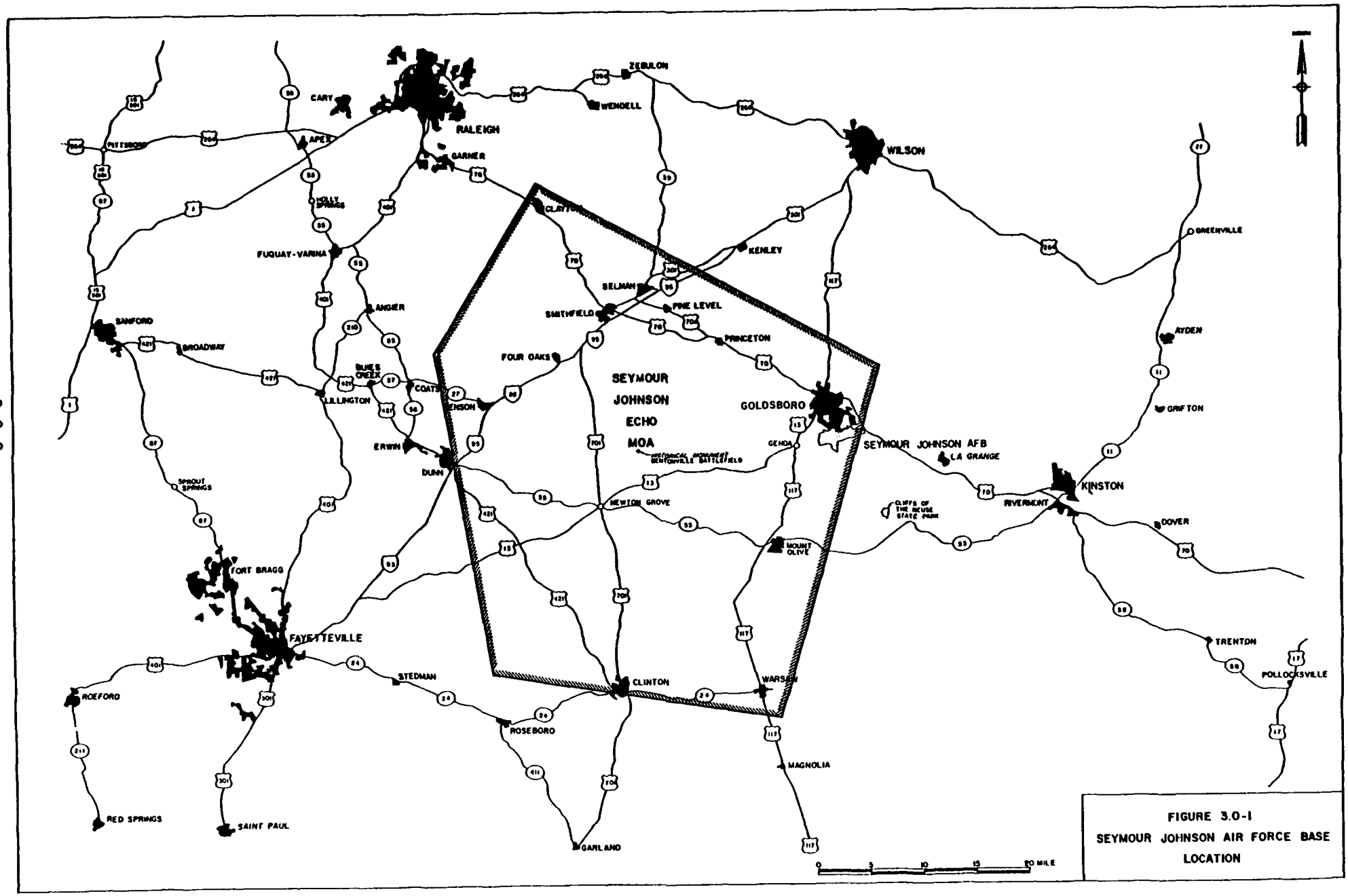


FIGURE 3.0-1
SEYMOUR JOHNSON AIR FORCE BASE
LOCATION

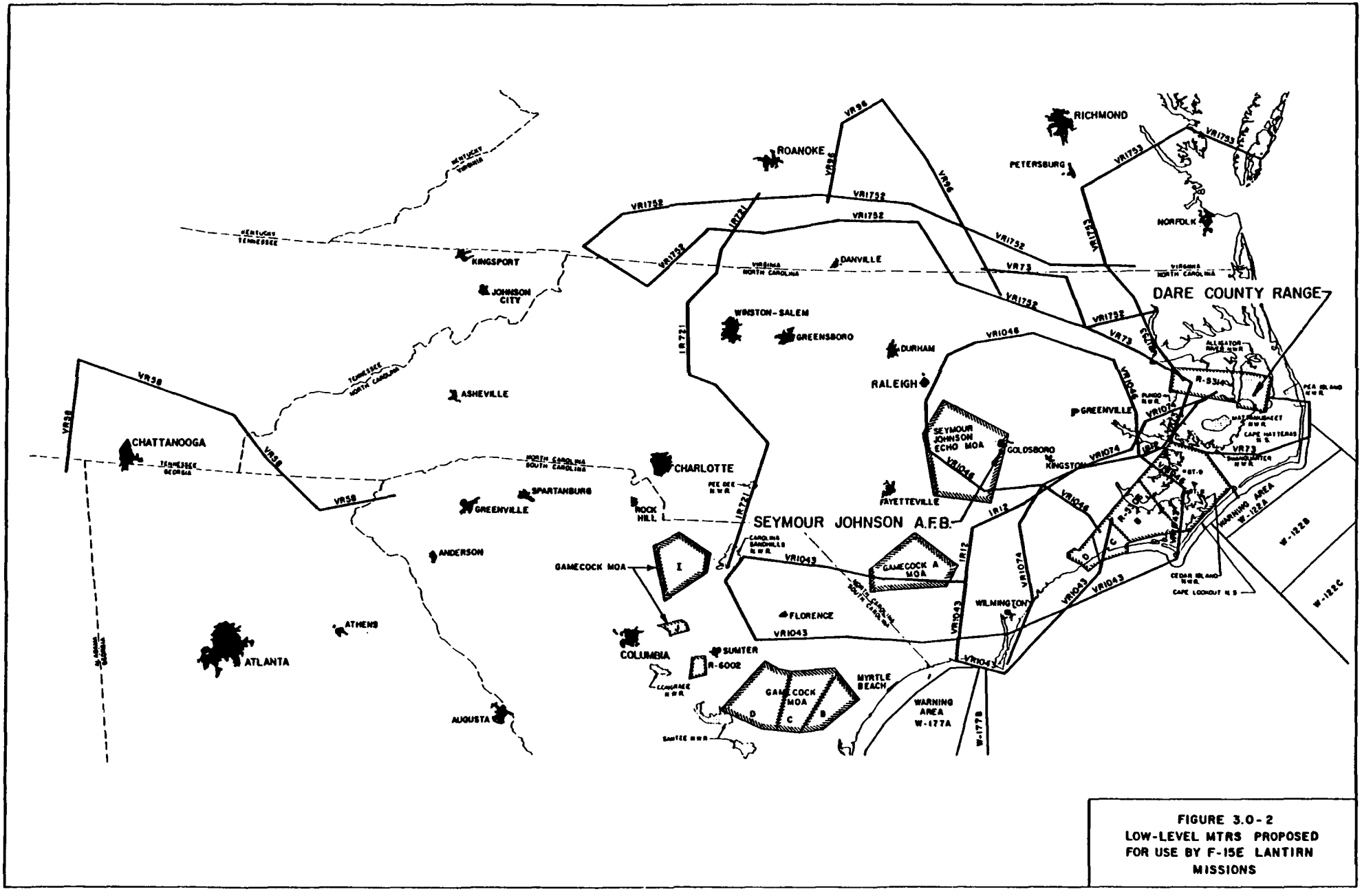


FIGURE 3.0-2
LOW-LEVEL MTRS PROPOSED
FOR USE BY F-15E LANTIRN
MISSIONS

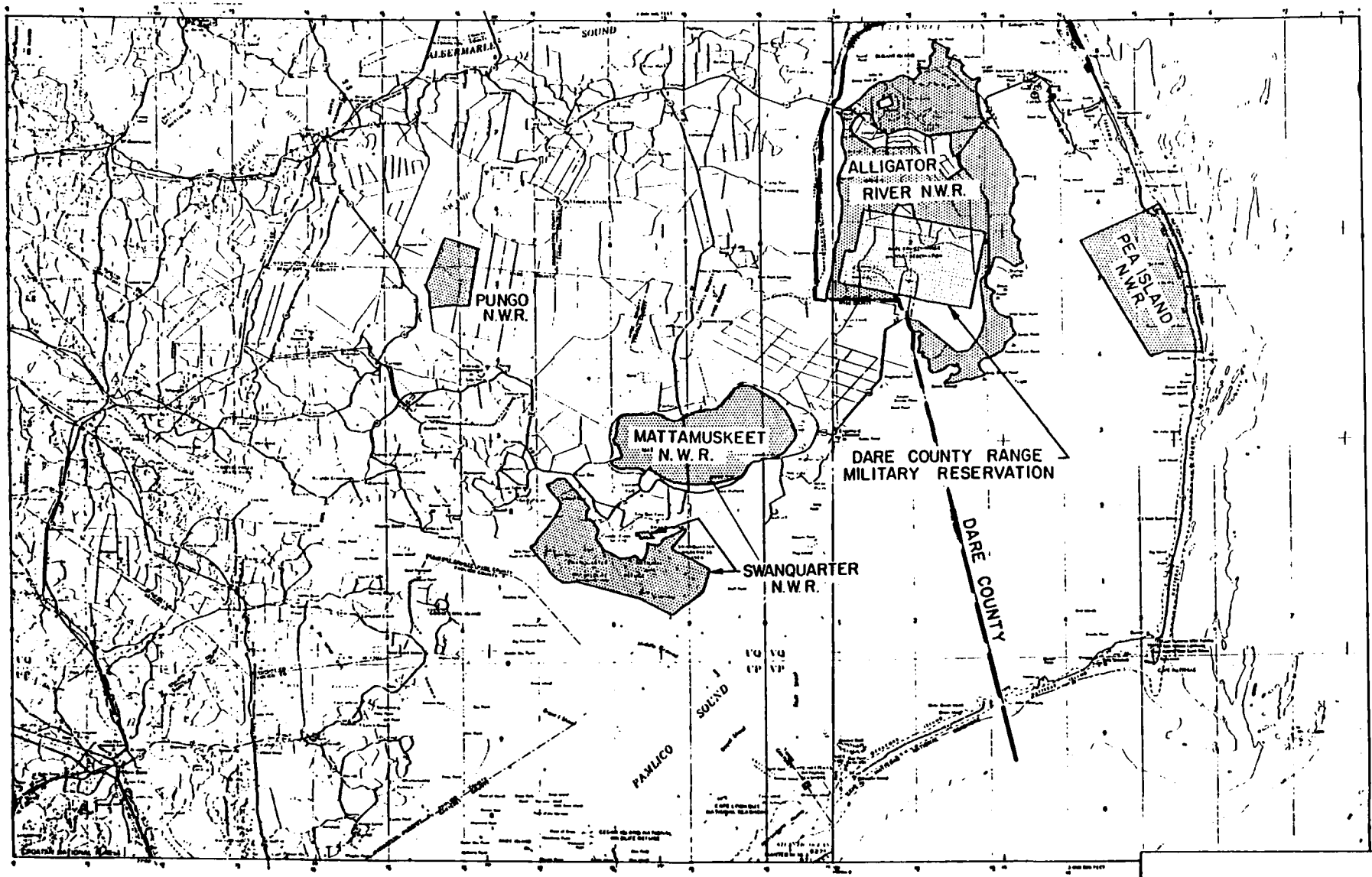


FIGURE 3.0-3
DARE COUNTY RANGE LOCATION

3.1 Air Quality and Meteorology

This analysis will assess the expected change in ambient air quality due to the phased replacement of F-4 aircraft with F-15s at Seymour Johnson AFB, North Carolina. This assessment considers the proposed changes in aircraft activities including the numbers and time distribution of sorties. Potential impacts at the Base are assessed for the various pollutants and time frames shown in Table 3.1-1. While the numbers of sorties on the various MTRs considered will increase, that increase is a relatively small percentage of the existing activity (about 14% on the average). Since the F-15E emissions are lower than those of the F-4s, it is expected that any change in air quality in any areas due to the proposed action will be modest. For these reasons, air quality changes for Echo MOA, Dare County Range (DCR) and the Military Training Routes (MTR) are not modeled, and impacts are assessed qualitatively.

3.1.1. Regulations and Permits

The Clean Air Act as amended in 1977 required that the Environmental Protection Agency (EPA) set national ambient air quality standards (NAAQS) for pollutants determined injurious to public health or welfare. The Act provides for both primary and secondary ambient air standards. Primary standards must reflect the level of attainment necessary to protect public health, while allowing for an adequate margin of safety. Secondary standards are designed to protect welfare, in addition to health, and are therefore more stringent than primary standards. The three-hour secondary standard for sulfur dioxide (SO_2) was set to prevent damage to vegetation.

EPA has issued ambient air standards for seven pollutants: carbon monoxide (CO), hydrocarbons (HC), lead (Pb), nitrogen dioxide (NO_2), total suspended particulates (PM), photochemical oxidants, and sulfur dioxide (SO_2). The primary and secondary long and short term ambient air standards for each of the seven pollutants are found in Table 3.1-2.

North Carolina has adopted the national primary and secondary ambient air quality standards for the State without modification. In the case of Seymour Johnson AFB, 35 stationary sources of air pollutants are covered by Permit No. 3743R2 issued by the State of North Carolina effective for the period November 19, 1985 to April 1, 1990. The general classifications of stationary sources are fuel oil boilers, degreasing tanks, incinerators, paint spray booths, woodworking operations, and floating-roof fuel storage tanks. Military aircraft emissions are not regulated under the Clean Air Act and therefore are not considered in the State Implementation Plan for attainment of standards.

3.1.2. Climatology and Meteorology

Figure 3.1-1 shows the location of the six major National Weather Service (NWS) sites in North Carolina. The climate near the Base and DCR is best represented by the Raleigh/Durham, Wilmington, and Cape Hatteras sites.

TABLE 3.1-1

SUMMARY OF AIR QUALITY STANDARDS TO BE STUDIED

Pollutant	Time-Frame
CO	8-Hour
CO	1-Hour
HC	3-Hour
NO_2	Annual
PM	Annual
PM	24-Hour
SO_2	Annual
SO_2	24-Hour
SO_2	3-Hour

TABLE 3.1-2

NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Primary Standards	Secondary Standards
Sulfur dioxide:	Annual arithmetic mean	80 ug/m^3 (.03 ppm)	
	24-hour[1]	365 ug/m^3 (0.14 PPM)	1,300 ug/m^3 (.50 ppm)
Particulate matter:	Annual geometric mean	75 ug/m^3	
	24-hour[1]	260 ug/m^3	150 ug/m^3
Carbon monoxide:	8-hour[1]	10 mg/m^3 (8 ppm)	
	1-hour[1]	40 ug/m^3 (35 ppm)	
Ozone[2]:		235 ug/m^3 (.12 ppm)	
Hydrocarbons:	3-hour[1,3] (6-9 a.m.)	160 ug/m^3 (.24 ppm)	
Nitrogen dioxide:	Annual arithmetic mean	100 ug/m^3 (.05 ppm)	
Lead:	Calendar quarter average	1.5 ug/m^3	1.5 ug/m^3

Source: BNA, 1982. Ambient Air Quality Standards Section. Washington, D.C.

[1]Maximum concentration not to be exceeded more than once per year.

[2]The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above .12 ppm is equal to or less than one. The primary and secondary ambient air standard for ozone is 235 ug/m^3 (.12 ppm) over a one hour period, not to be exceeded more than once per year.

[3]Hydrocarbons and nitrogen dioxide both are precursors to ozone formation. At one time both were subject to ambient air quality standards and regulation. However, hydrocarbons were regulated only because they create ozone, not because they in themselves create harmful effects on health. Although there is no longer an HC standard, it will be used as a guide for the ozone standard in this analysis.

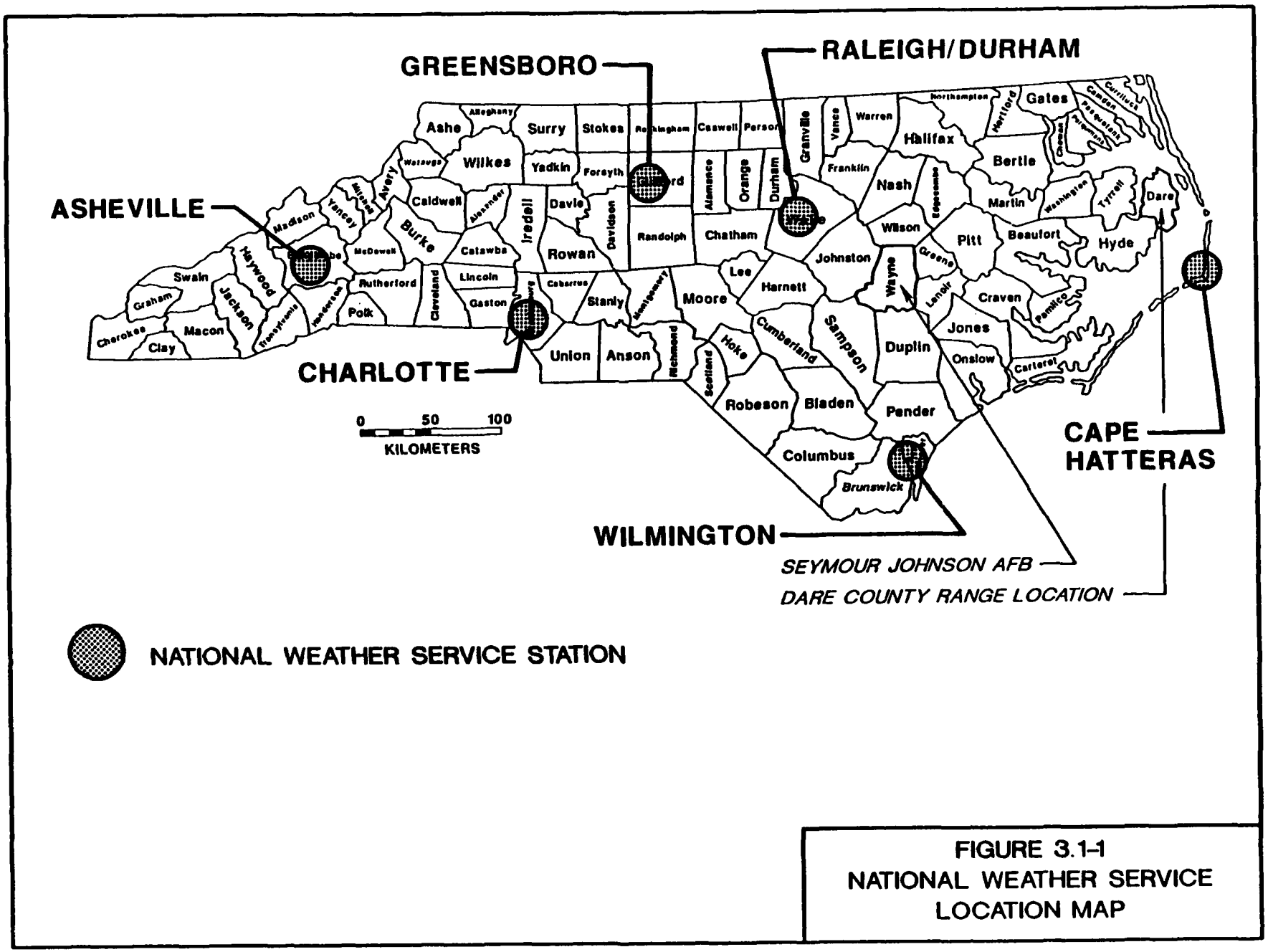


FIGURE 3.1-1
NATIONAL WEATHER SERVICE
LOCATION MAP

The Raleigh-Durham Airport is centrally located between the mountains on the west and the coast on the south and east in the zone of transition between the Coastal Plain and the Piedmont Plateau. The mountains form a partial barrier to cold air masses moving eastward from the interior of the Nation. As a result, there are very few days in the heart of the winter season when the temperature falls below 20°F. Tropical air is present over the eastern and central sections of North Carolina during much of the summer season, bringing warm temperatures and rather high humidities to the Raleigh-Durham area frequently during the summer. Afternoon temperatures reach 90°F or higher an average of about every fourth day in the middle of the summer, but reach 100°F an average of less than once per year. Rainfall is well distributed throughout the year as a whole. July has, on an average, the greatest amount of rainfall, and November the least. The Raleigh-Durham area is far enough from the coast so that the weather effects of coastal storms are reduced (NOAA, 1980).

Wilmington is located in the tidewater section of southeastern North Carolina, near the Atlantic Ocean. The maritime location makes the climate of Wilmington unusually mild for its latitude. All wind directions from the east-northeast through southwest have some moderating effects on temperatures throughout the year, as the ocean is relatively warm in winter and cool in summer. The daily range in temperatures is moderate compared to a continental type of climate. As a rule, summers are quite warm and humid, but excessive heat is rare. Sea breezes, arriving early in the afternoon, tend to alleviate the heat inland beyond Wilmington. Long-term averages show afternoon temperatures reach 90°F or higher a third of the days in midsummer, but several years may pass without 100°F weather. Most winters are short and quite mild. Less than once each winter, the temperature remains below the freezing point for an entire day. Rainfall in this area usually is ample and well-distributed throughout the year, the greatest amount occurring in the summer. In common with most Atlantic Coastal localities, the area is subject to the effects of coastal storms and occasional hurricanes which produce high winds, above normal tides, and heavy rains (NOAA, 1980).

Cape Hatteras with its maritime climate is cooler in the summer and warmer in winter than the mainland. Ninety degree temperatures are rare. The average rainfall at Cape Hatteras is greater than for other North Carolina coastal stations. This is due to a large extent to heavy and prolonged rains associated with offshore storms. These storms usually move north before reaching full maturity and only mildly affect the Hatteras area. Rainfall is rather evenly distributed throughout the year reaching a maximum in July, August, and September. Snow-fall is rare and is usually light in amount, melting as it falls. Tropical storms moving up the Atlantic Coast occasionally pass within a few miles of Cape Hatteras. These storms produce heavy rains and strong winds and tides over the island. The vegetation of the area shows the effect of these winds (NOAA, 1980).

Wayne County, North Carolina, in which Seymour Johnson AFB is located, has a temperature climate typical of the southern coastal plain. Average monthly temperatures range from 33°F (1°C) in January to 71°F (22°C) in July. On the

average, there are about 138 days of temperatures 80°F (27°C) or more, 33 days of 90°F (32°C) or more and 53 days with temperatures freezing or below. Mean annual precipitation is about 51 inches. Average relative humidity is 83 percent just before dawn and 53 percent in the early afternoon.

Prevailing winds during April through August are southerly at about 6 miles per hour and northerly at about 7 miles per hour during October through March. Calm conditions occur approximately 19 percent of the time. Mixing heights form "lids" on the atmosphere that can trap pollutants near the ground. Table 3.1-3 was prepared from mixing heights (Holzworth, 1972) to illustrate climatological mean mixing heights for the seasons and an annual mean, and includes both morning and afternoon observations. These data represent the vertical structure of the atmosphere in the project area for the Base and DCR. Table 3.1-4 shows the frequency of occurrence of stability classes in the study area.

3.1.3. Air Monitoring Data

To establish the various current air quality levels that are representative of the various airspaces potentially affected by the proposed action, the 1984 air quality data for North Carolina published by the Department of Environmental Management of the North Carolina Department of Natural Resources and Community Development were consulted.

Table 3.1-5 summarizes the worst-case impact for any monitor site (1984) within North Carolina counties that potentially would be influenced by the proposed action. Figures 3.1-2 through 3.1-6 show the counties in North Carolina that contain a monitor for the various pollutants. Those counties that have at least one exceedance of the standard level are identified. It should be understood that the standards allow for no more than one exceedance for certain pollutants. The designations seen in Table 3.1-5 and Figures 3.1-2 through 3.1-6 do not necessarily show areas that have been declared "non-attainment" by EPA or by the State of North Carolina. (See Appendix A for data on attainment areas).

Seymour Johnson AFB is located in Wayne County and Echo MOA overlies Wayne, Johnston, and Sampson Counties, including portions of Duplin and Harnett Counties. Wayne County is in the Southern Coastal Plain Interstate Air Quality Region (Air Quality Control Region 170). The quality of the air in this region is classified as being "better than national standards" (USEPA, 1976). The DCR lies entirely within Dare County. MTRs approaching DCR and other coastal operations areas traverse many of the counties east of Raleigh, North Carolina. Craven County southeast of Greenville, North Carolina, and Halifax County north of Greenville show an exceedance of the 24-hour standard for particulates (PM) (Table 3.1-5). An exceedance of the 8-hour carbon monoxide (CO) standard is evident for Durham, Forsyth and Wake Counties. These counties are in the metropolitan areas of Raleigh-Durham and Winston-Salem.

TABLE 3.1-3

SUMMARY OF EASTERN NORTH CAROLINA
MIXING HEIGHTS

Season	Time of Day	Mean Mixing Height Meters	(Feet)
Winter	Morning	550	(1,804)
Spring	Morning	550	(1,804)
Summer	Morning	600	(1,969)
Autumn	Morning	450	(1,476)
Annual	Morning	500	(1,640)
Winter	Afternoon	900	(2,953)
Spring	Afternoon	1,400	(4,593)
Summer	Afternoon	1,400	(4,593)
Autumn	Afternoon	1,100	(3,609)
Annual	Afternoon	1,200	(3,937)

Source: Holzworth, 1972.

TABLE 3.1-4

PERCENTAGE OCCURRENCE OF STABILITY
CLASSES AT CHERRY POINT, NORTH CAROLINA
(1967-1971)

Stability Class[1]	National Climatic Center Definition	Frequency of Occurrence (Percent)
A	Extremely Unstable	1.2
B	Unstable	8.1
C	Slightly Unstable	13.9
D	Neutral	34.5
E	Slightly Stable	42.2
F	Stable to Extremely Stable[2]	

[1] Stability Class A indicates a rapid rate of dispersion while Class F indicates a slow rate of dispersion.

[2] Combined with Class E stability.

Source: Doty and Wallace, 1976.

TABLE 3.1-5

NORTH CAROLINA WORST-CASE MONITOR READINGS BY COUNTY

County	Worst-Case Impact (ug/m^3)								
	O_3	CO		NO2	PM		SO2		
	(1-Hr)	(8-Hr)	(1-Hr)	(Annual)	(Annual)	(24-Hr)	(Annual)	(24-Hr)	(3-Hr)
Alamance					50	92			
Beaufort					42	98	16	145	326
Brunswick					51	105			
Cartaret					68	136			
Chatham					39	97			
Columbus					45	135	13	82	161
Craven					56	158*			
Cumberland					48	90			
Davidson					57	112			
Davie	0.106						11	40	111
Durham		1700*	2700		48	140			
Edgecombe	0.094						12	70	146
Forsyth	0.102	1300*	2200	27	56	149	20	76	128
Green	0.094						10	57	104
Guilford	0.111				47	120	14	51	130
Halifax					50	216*			
Harnett					50	116			
Johnston	0.103						9	44	98
Lenoir					38	71			
Martin	0.105						9	74	105
McDowell					59	142			

continued next page

TABLE 3.1-5 (Continued)

NORTH CAROLINA WORST-CASE MONITOR READINGS BY COUNTY

County	Worst-Case Impact (ug/m^3)								
	Ozone (1-Hr)	CO (8-Hr)	CO (1-Hr)	NO2 (Annual)	PM (Annual)	PM (24-Hr)	SO2 (Annual)	SO2 (24-Hr)	SO2 (3-Hr)
Moore	0.105						11	49	78
Nash					50	126			
New Hanover	0.099								
Onslow					54	108			
Orange					44	104			
Pasquotank					39	78			
Person	0.098				32	109	11	59	185
Randolf					44	101			
Richmond					43	85			
Robeson	0.097				46	107	9	3C	68
Rowar					55	127			
Sampson					43	85			
Scotland					49	76			
Surry					43	100			
Wake	0.10	2100*	2700		46	105			
Washington					41	83			
Wayne					50	139			
Wilson					54	129			

*Over standard for respective pollutant.

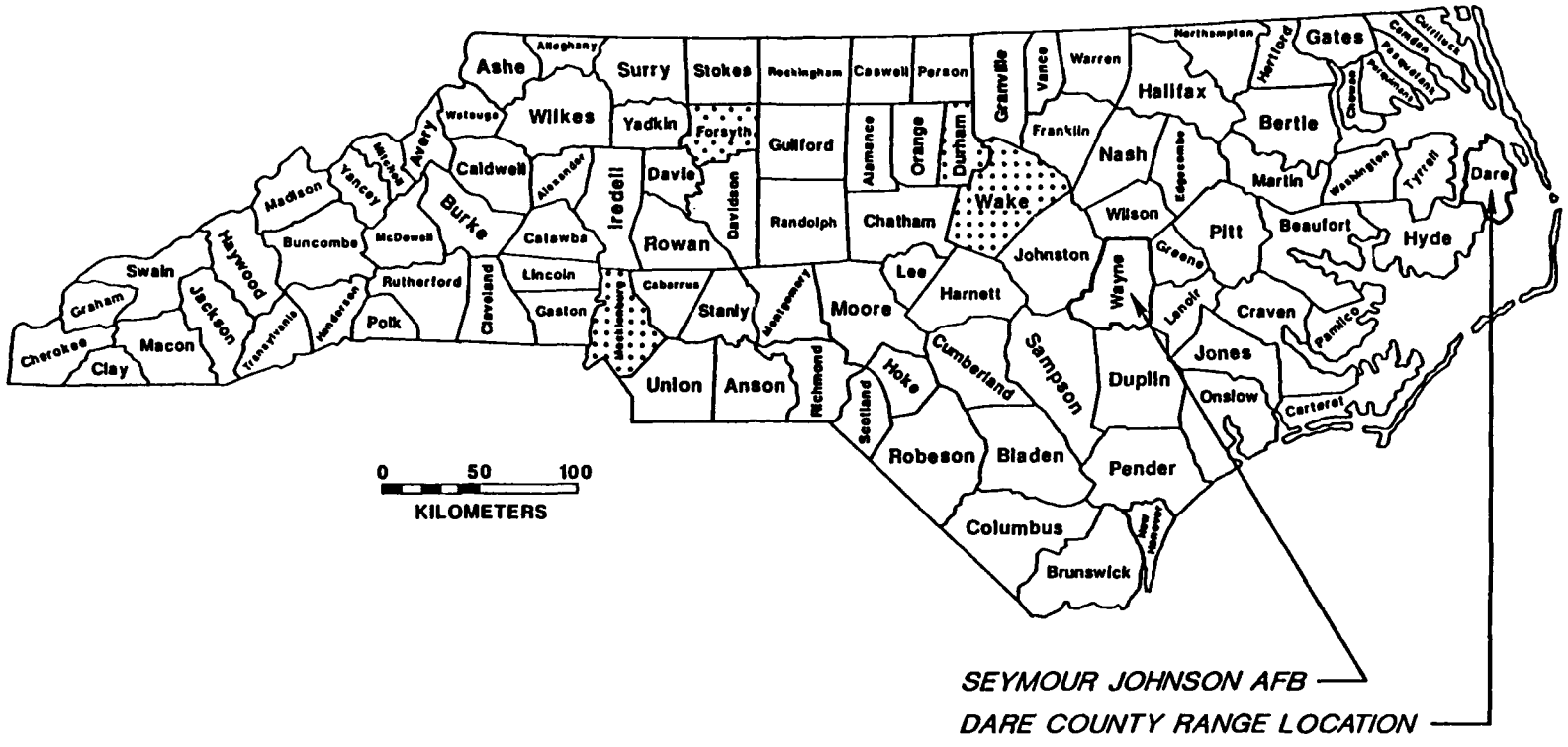


FIGURE 3.1-2
CO MONITOR
LOCATION MAP

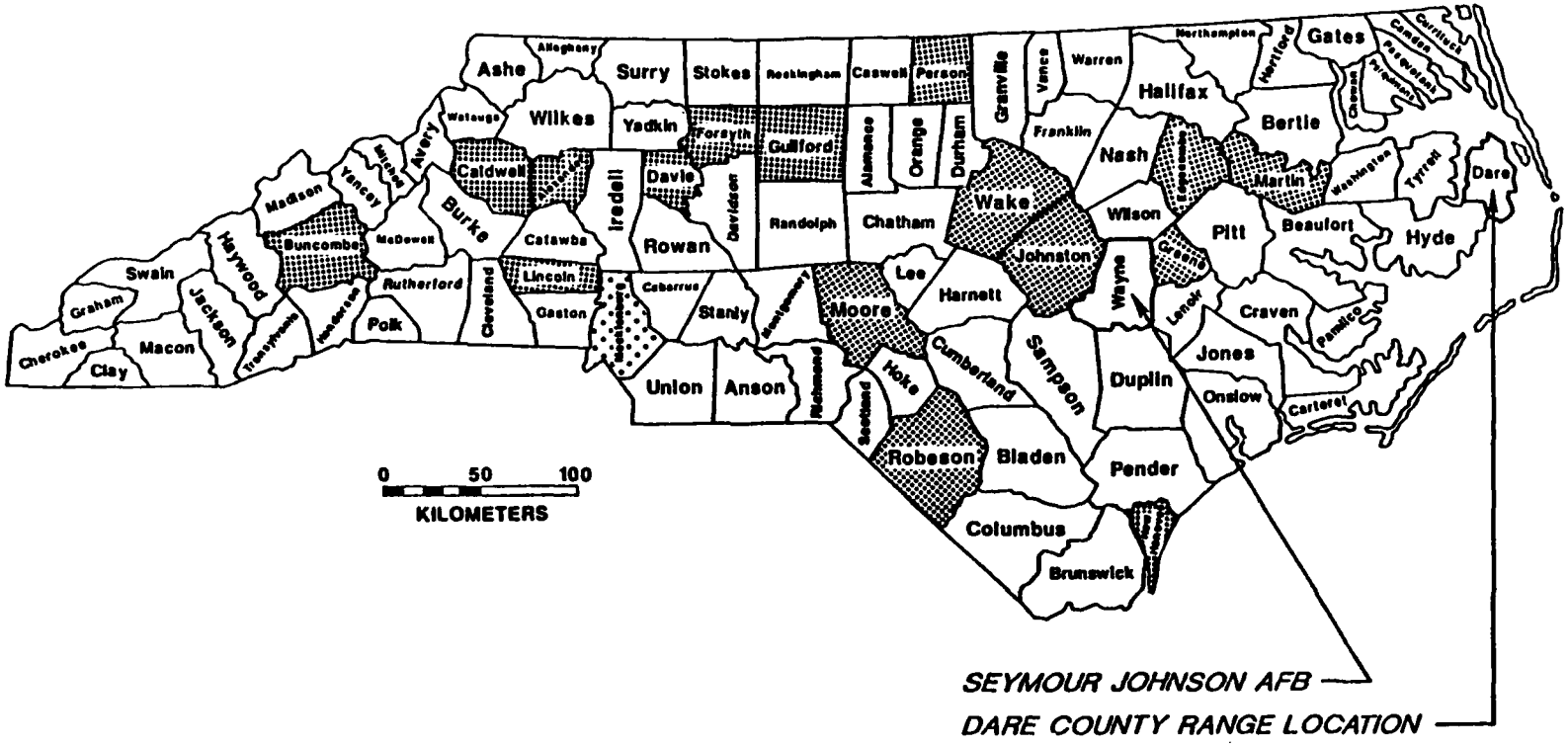


FIGURE 3.1-3
O_3 MONITOR
LOCATION MAP

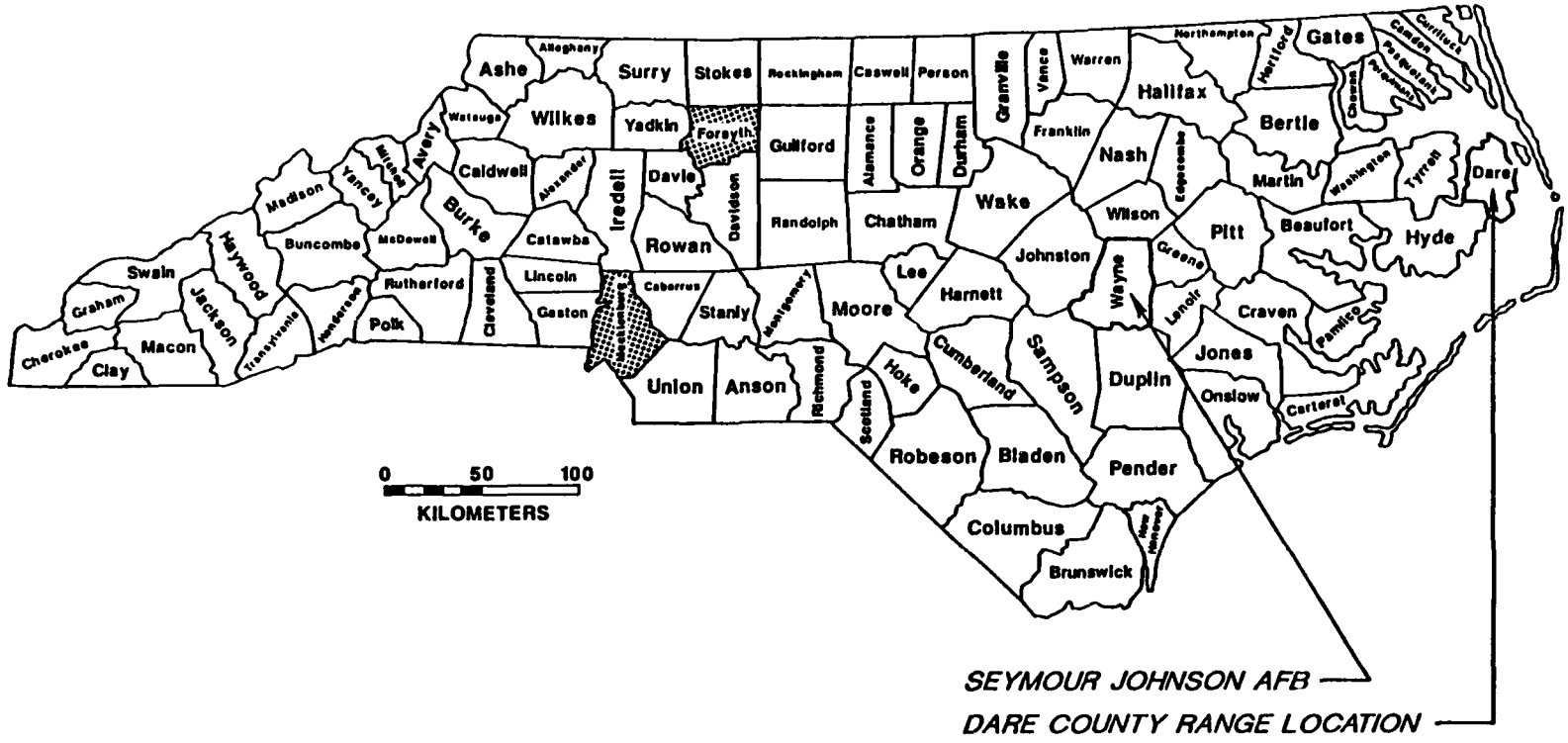


FIGURE 3.1-4
NO_2 MONITOR
LOCATION MAP

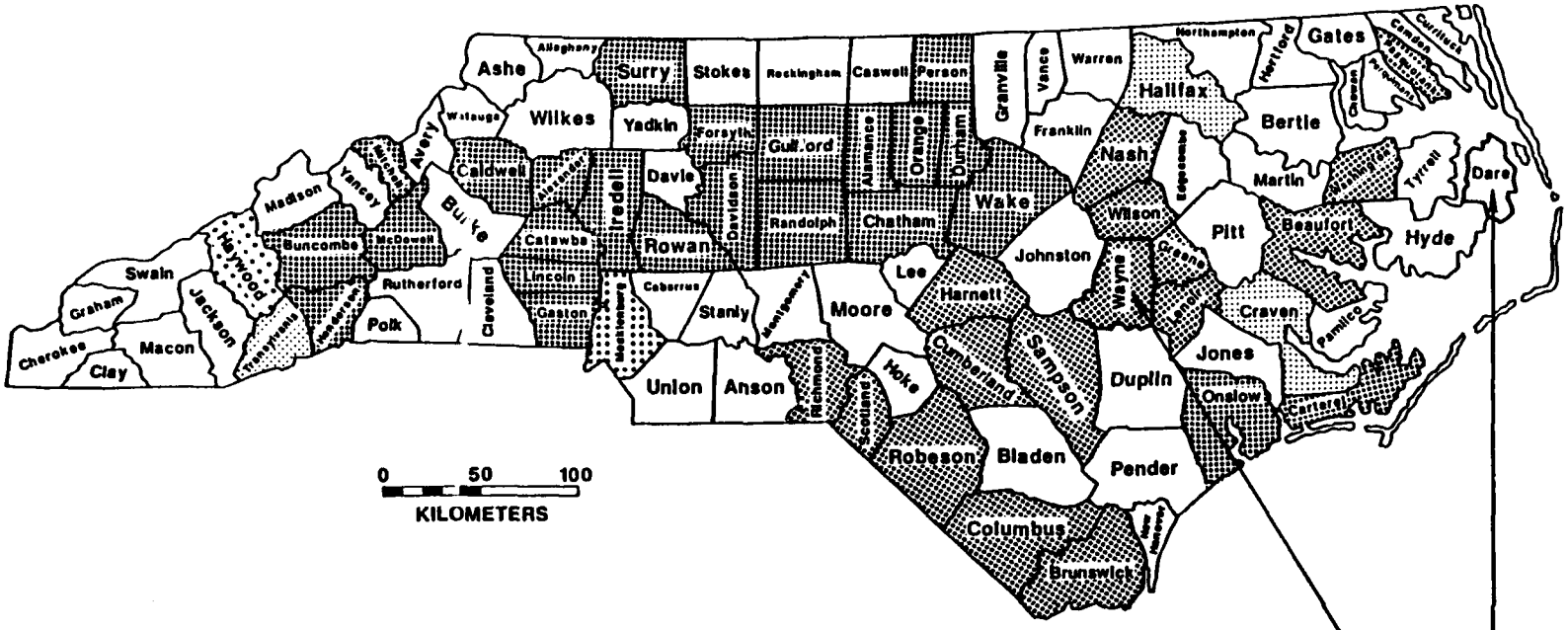


FIGURE 3.1-5
PM MONITOR
LOCATION MAP

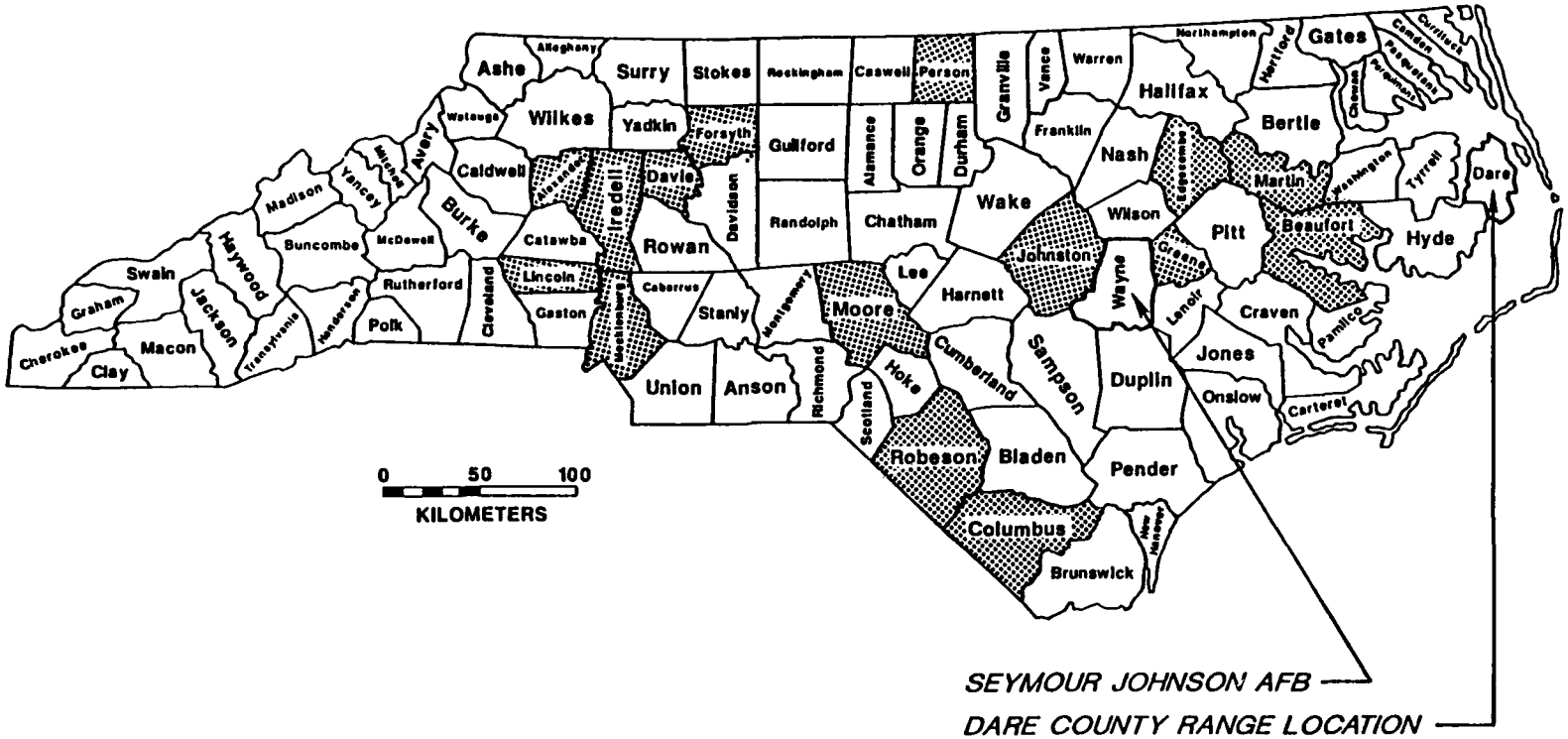


FIGURE 3.1-6
SO_2 MONITOR
LOCATION MAP

3.1.4. Area Sites Sensitive to Air Quality

Figure 3.1-7 (ERT, 1980) shows the location of the five Class I areas located in North Carolina:

1. Swanquarter Wilderness Area
2. Linville Gorge Wilderness Area
3. Shining Rock Wilderness Area
4. Great Smokey Mountains National Park
5. Joyce Kilmer-Slickrock Wilderness Area

There are no sites sensitive to air quality (i.e., no Class I areas) within the area influenced by air emissions from sources on the Base or Echo MOA.

MTR VR-73 passes immediately to the south of the Swanquarter Class I area, however, and the operational area for the BT-9 Range (R-5306 A) also is within close proximity (see Figure 3.0-3).

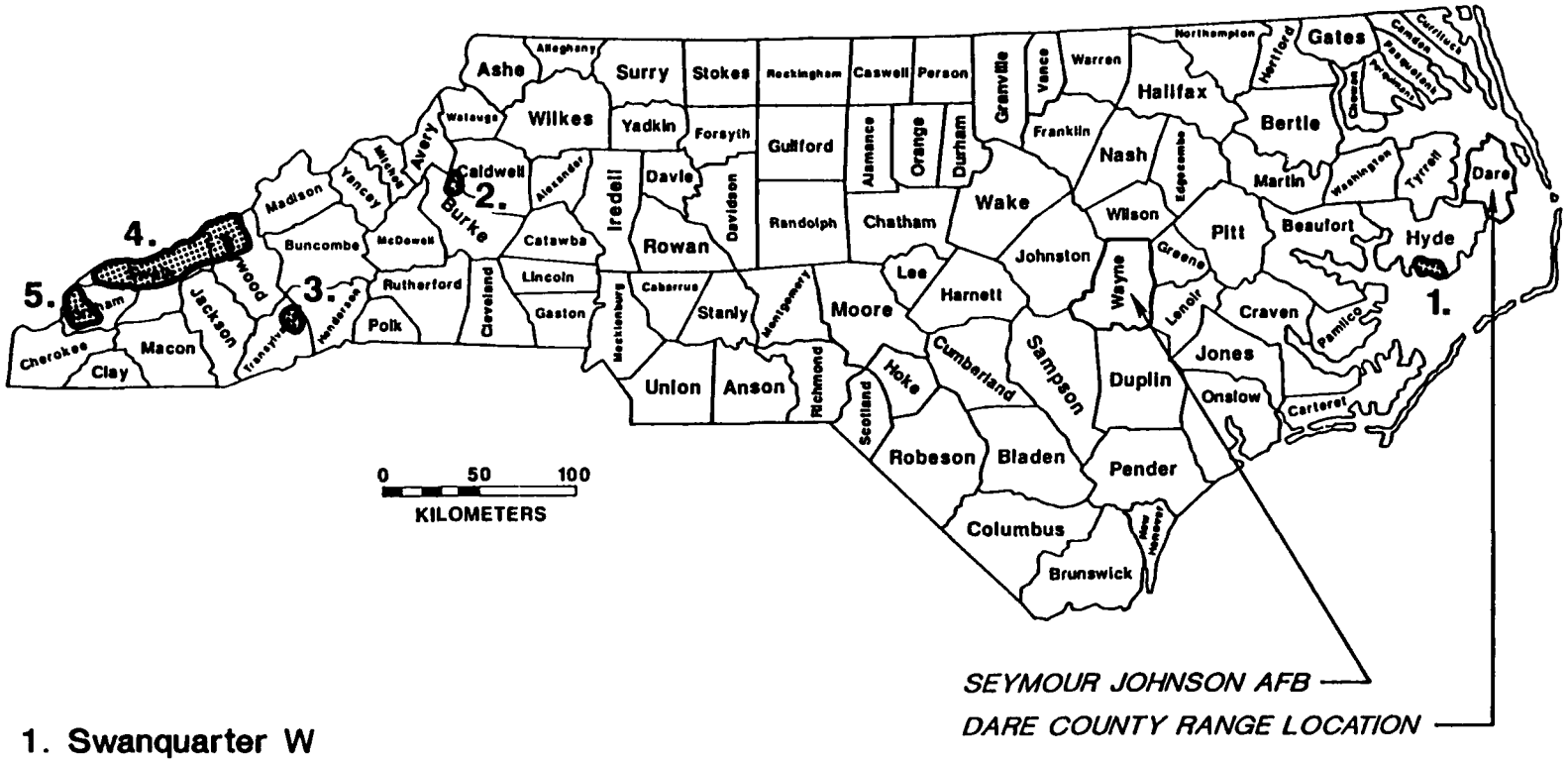
VR-58 passes between two Class I areas, the Joyce Kilmer-Slickrock Wilderness Area in North Carolina and the Cohutta Wilderness Area along the boundary between Tennessee and Georgia. Aircraft using this MTR should, however, pass at least 10 miles distant from either of these areas.

Other Class I areas at similar distances from operations areas or MTRs include the James River Face Wilderness Area near VR-96 in Virginia, and the Cape Romain Wilderness Area near the S-177A Restricted Air Space in South Carolina.

3.1.5. Human Health Considerations

The Clean Air Act, as amended in 1977, requires the EPA to set national ambient air standards for air pollutants determined to be injurious to public health or welfare. In the setting of ambient air standards, the EPA is required to consider the most recent scientific evidence concerning identifiable effects of an air pollutant on public health or welfare, variable factors that could alter the pollutant's effects on public health or welfare, and the interaction of pollutants that may produce adverse effects on public health or welfare.

The scientific evidence used to support national ambient air standards is given in reports called "criteria documents" that are available for public review and comment. Furthermore, the Clean Air Act requires that the ambient air standards be reviewed and, if necessary, revised over five-year intervals beginning by December 31, 1980. At the time of this assessment, the standards are being reviewed. Criteria documents reflecting the most recent scientific evidence have been drafted and are being subjected to critical review by the scientific community as well as the public. The need for changes to the standards is likewise being debated. Therefore, this review of the health effects of the air pollutants is based primarily on the original criteria documents with comments about more recent scientific findings given in draft documents. Since the latter information is still being reviewed, it should be considered as tentative until affirmed by consensus and published in the final criteria documents.



1. Swanquarter W
2. Linville Gorge W
3. Shining Rock W
4. Great Smoky Mountains NP
5. Joyce Kilmer - Slickrock W

FIGURE 3.1-7
CLASS I AREA
LOCATION MAP

The air pollutants affected by changes in air and ground activities being considered in this assessment are particulate matter PMs, oxides of nitrogen (NO_x, NO_2), CO, oxides of sulfur (SO_x, SO_2), and HC.

The major air pollutant created by aircraft flight and ground activities is CO. Carbon monoxide is an odorless, tasteless, and colorless gas generated by the incomplete combustion of common fossil fuels. Adverse health effects of CO to humans are associated with diminished oxygen (O_2) transport by the blood stream and with interference with the use of O_2 by body tissues. The chemical binding of CO to hemoglobin (Hb) is some 200 times stronger than the binding of O_2 so that tissues may be deprived of O_2 when there is an elevated level of carboxyhemoglobin (COHb) in the blood. Normal metabolic processes in the human body result in COHb levels of about 0.5 percent. Higher levels result when CO is present in the air breathed by a human. The most significant physiological characteristic of CO is that it is irreversibly bound by Hb. CO is a competitor with O_2 for binding sites on the Hb molecule reducing the O_2-carrying capacity of the molecule. This reduction is proportioned to the amount of COHb present. Some of the effects of CO on the human body include reduced vigilance, visual perception, manual dexterity, learning ability, and performance of complex sensorimotor tasks. These effects seem to occur at COHb of 5 percent or more but are the subject of debate in the current review of scientific studies on the subject. Persons particularly affected by exposure to CO are fetuses and those with impaired cardiovascular functions.

NO_2 primarily affects the respiratory process in humans by increasing airway resistance and impairing the transport of gases between the lungs and the blood. A secondary effect of NO_2 is on sensory perception functions, primarily dark adaptation. The health significance of this latter effect is difficult to appraise but seems to be negligible except for those persons engaged in activities requiring rapid dark adaptation.

The non-toxic effects of PM on human health are related to injury to the surfaces of the respiratory system. At concentrations of 750 mg/m^3 and higher and accompanied by high SO_2 concentrations there is increased risk of respiratory illness and death. At lower concentrations, health effects range from acute worsening of symptoms in bronchitis patients and increased mortality for persons over 50 years old. PM in the size range of about 0.5 to 6 microns is particularly injurious because these particles can enter and remain trapped in the respiratory system. The toxic effects of particulates vary with composition.

High levels of SO_2 increase the incidence and severity of bronchitis and cause both temporary and permanent injury to the respiratory system. The adverse effects of high levels of particulate matter in combination with SO_2 are well documented and were the major contributors to the increased mortality and morbidity in air pollution episodes such as in Denora, Pennsylvania in 1948, and London, England in 1952.

Many HCs, with the notable exceptions of benzene and aldehydes, are non-toxic. The formation of ozone (O_3), through photochemical reactions involving HC and

NO_x, is the primary reason for regulatory control of the HC category.

Under existing (baseline) conditions, the Seymour Johnson AFB and Echo MOA are located in areas that are considered by the EPA and the State of North Carolina to have air quality, as measured by concentrations of the criteria air pollutants, that equals or exceeds the national ambient air standards. The DCR is located in a remote, sparsely populated area with few sources of man-made air pollutants.

3.2. Noise

3.2.1. Regulations

Fighter-type aircraft are not regulated by the Noise Control Act because the Act only controls Federal Aviation Administration (FAA) certified aircraft. The principal concern of local governments regarding aircraft noise is the planning of land use. The U. S. Department of Housing and Urban Development (HUD) and the Veterans Administration (VA) have issued noise regulations for the purpose of protecting individuals and communities. These regulations are used as criteria for allocation of federal urban development funding.

The FAA regulates airspace and must approve flight routes. In the flight route approval process, the effect of noise on the environment is a consideration.

3.2.2. Descriptors of Environmental Noise

In evaluating airport and aircraft noise, two different types of noise measures are needed, one, to measure single noise events such as the noise of an individual aircraft flyover and another to describe the noise environment based on the cumulative effect of a number of complex noise events, such as the flight and ground operations of an air base. In this study, the single noise event measure used will be A-weighted sound level dB(A) and the sound exposure level (SEL). The cumulative energy average noise metric used will be the day-night average noise level (DNL) (USAF, 1985a). A summary of acoustical terms can be found in Appendix B.

The A-weighted sound level metric, dB(A) is the instantaneous measure of a single sound event. A-weighted sound pressure level is a sound metric which has been weighted to de-emphasize the high and low frequency portions of the noise signal. This weighting correlates well with the human perception of sound.

The SEL metric is a single number representation of a noise energy dose. This measure takes into account the effect of both the duration and magnitude of a noise event such as an aircraft flyover. SEL is measured in decibels (dB) on the A-weighted scale. Development of the SEL metric is discussed in more detail in USAF (1985a).

The cumulative energy average metric has been found to correlate well statistically with aggregate community annoyance response. The DNL has found wide acceptance by federal and local agencies as the primary measure for describing noise effect on communities (Newman and Beattie, 1985). The DNL has been shown to be an effective tool for noise impact analysis for over fifteen years of use and is the noise assessment metric endorsed by the Federal Interagency Committee on Urban Noise [EPA, Department of Defense (DOD), HUD, Department of Transportation (DOT), and VA]. The DNL is a 24-hour average sound level measure. Night-time noise emissions are weighted with a 10 dB penalty to account for increased community annoyance during the hours between 10:00 P.M. and 7:00 A.M. Time of week and seasonal variations are not considered. The DNL can be derived directly from actual sound level measurement or generated using a

computer simulation of the noise environment.

It has been accepted that where a noise environment is dominated by major identifiable noise sources such as an airport, well defined predictive models can be used to describe the environment (CHABA, 1977). The DNL model incorporates a number of parameters describing the intensity, duration and frequency of the noise generated by flight operations. It provides an effective way for assessing the cumulative and incremental effect of changes in flight operations. The model used in this report is NOISEMAP which is processed by the USAF Engineering and Services Center, Tyndall AFB, Florida.

In addition to aircraft flight data, the NOISEMAP also incorporates noise from the base ground operations. This ground noise would include aircraft taxiing, take-off roll and engine run-up noise during maintenance operations.

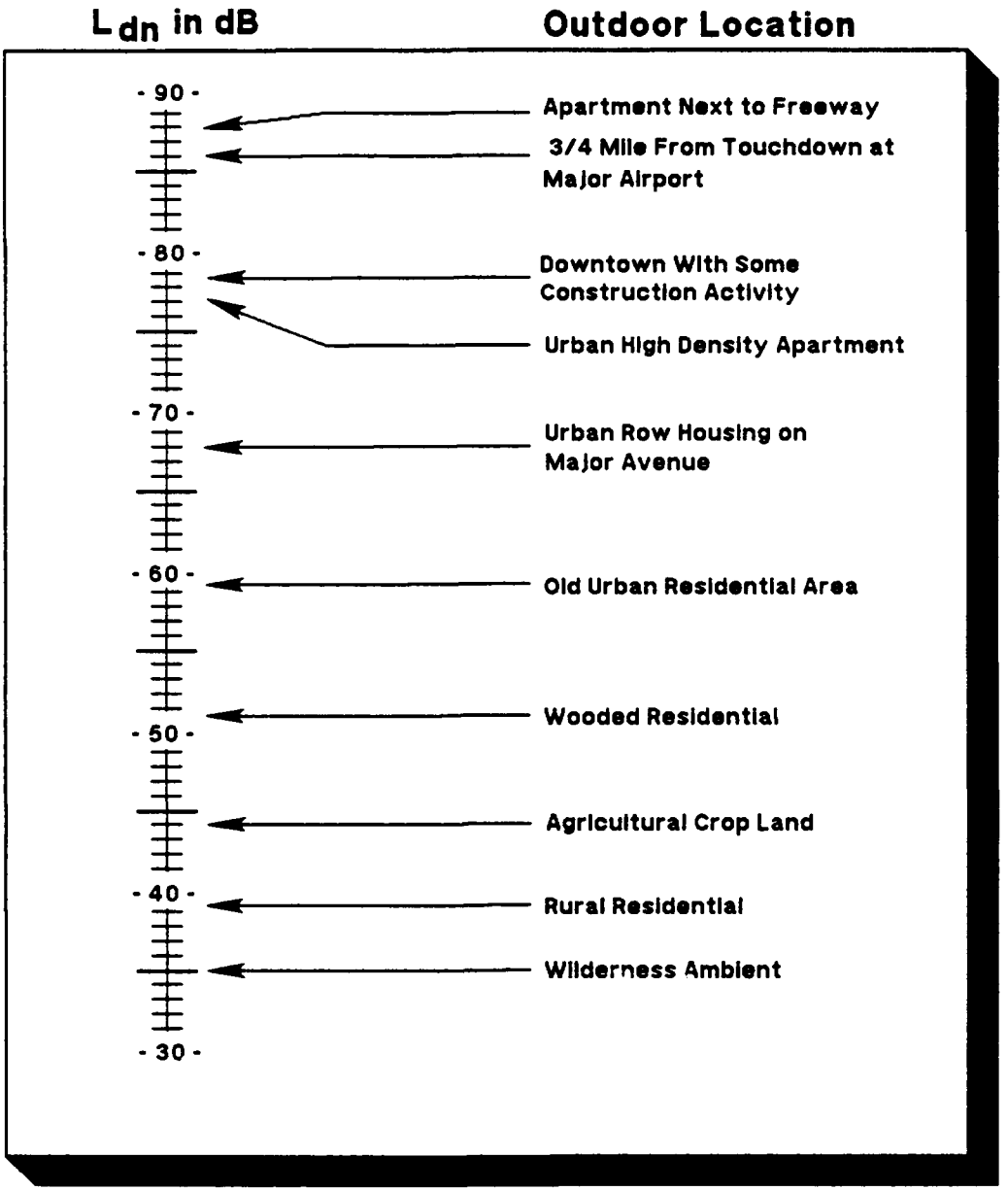
From these data, the computer projects the estimated DNL noise level exposure at ground level. Contour lines are drawn indicating areas of equal sound level DNL. Typically contour lines are drawn for DNL levels of 65, 70, 75, and 80 dB. Figure 3.2-1 illustrates comparative DNL levels for various environments. Further description of the DNL is included in USAF (1985a).

In the Aviation Noise Effects publication developed for the FAA, Newman and Beattie (1985) state that "Noise contours or footprints are the accepted technique for displaying airport cumulative noise exposure." The noise contours are generated by a computer simulation model that processes an extensive collection of input data. These data include the flight track, flight profile, noise signature of the aircraft, engine power setting, etc. of every flight over a typical 24-hour day.

For analysis purposes, noise contours have been overlaid on U.S. Geological Survey maps. Figure 3.2-2 provides Air Installation Compatible Use Zone (AICUZ) noise contours for Seymour Johnson AFB (Seymour Johnson Air Force Base, 1983). Since that time aircraft changes have occurred (i.e., inactivating an F-4 squadron and conversion of KC-135's to KC-10's) which have resulted in a change in noise contours. Figure 3.2-3, showing the modified contours, represents the baseline used for comparative analysis. The Proposed Action noise contours are presented and discussed in Section 4.2 of this assessment.

3.2.3. Noise Sources

Modern military aircraft produce three million times the sound energy of the human voice. Turbojet and turbofan engines in general produce considerably more acoustical energy than turboprop or piston engines. In addition to higher sound intensity, jet engines may produce more high frequency noise which generally is more annoying. Table 3.2-1 shows the noise level of jet aircraft relative to other noise sources.



SOURCE: USEPA, 1978. PROTECTIVE NOISE LEVELS, CONDENSED VERSION OF EPA LEVELS DOCUMENT

FIGURE 3.2-1
EXAMPLES OF DNL LEVELS FOR VARIOUS OUTDOOR ENVIRONMENTS

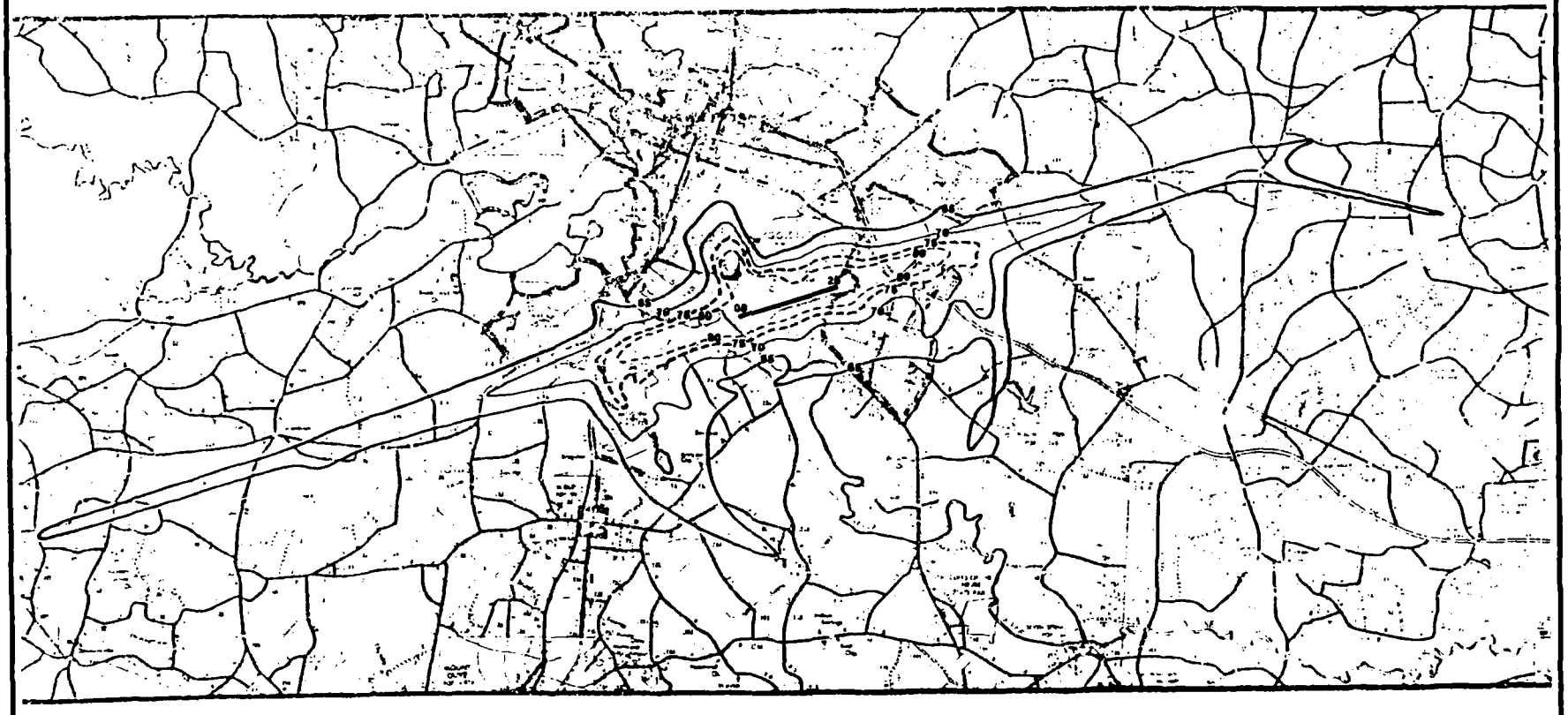


FIGURE 3.2-2
1983 AICUZ NOISE CONTOURS
(FROM SEYMOUR JOHNSON
AIR FORCE BASE, 1983)

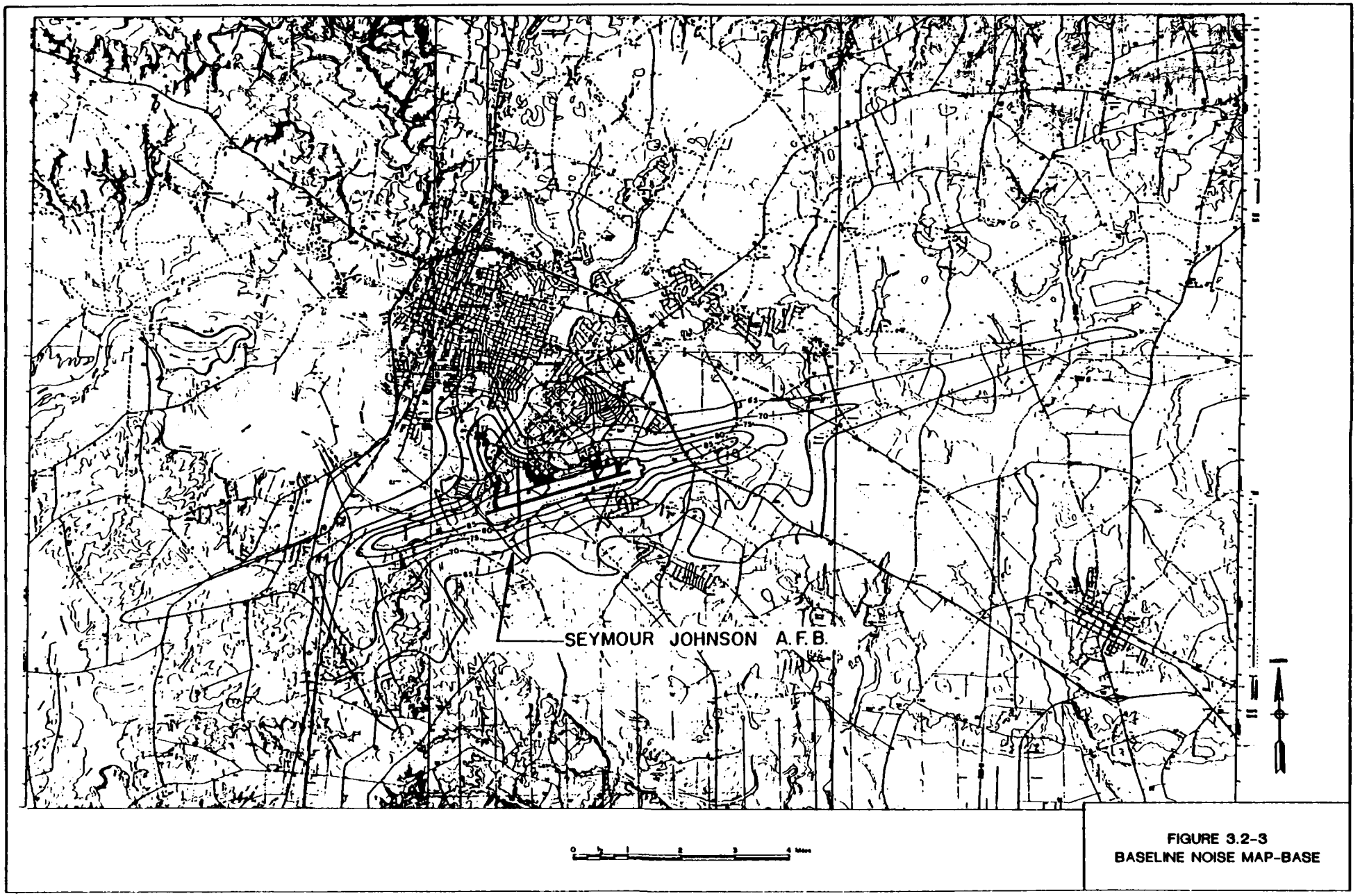


FIGURE 3.2-3
BASELINE NOISE MAP-BASE

TABLE 3.2-1

TYPICAL DECIBEL [dB(A)] VALUES ENCOUNTERED IN DAILY LIFE AND INDUSTRY*

	dB(A)
Rustling leaves	20
Room in a quiet dwelling at midnight	32
Soft whispers at 5 feet	34
Men's clothing department of large store	53
Window air conditioner	55
Conversational speech	60
Household department of large store	62
Busy restaurant	65
Typing pool (9 typewriters in use)	65
Vacuum cleaner in private residence (at 10 feet)	69
Ringing alarm clock (at 2 feet)	80
Loudly reproduced orchestral music in large room	82
Beginning of hearing damage if prolonged exposure over 85 dB(A)	
Printing press plant	86
Heavy city traffic	92
Heavy diesel-propelled vehicle (about 25 feet away)	92
Air grinder	95
Cut-off saw	97
Home lawn mower	98
Turbine condenser	98
150 cubic foot air compressor	100
Banging of steel plate	104
Air hammer	107
Jet airliner (500 feet overhead)	115
F-15 Aircraft (500 feet, afterburner power)	123

* When distances are not specified, sound levels are the value at the typical location of the machine operators.

Source: Newman and Beattie, 1985.

The two major sources of jet engine noise are the roar of the jet exhaust and compressor/fan noise from the turbulence produced by the engines rotating blades. The use of afterburners, which increases exhaust jet velocity, compounds the noises produced. (USAF, 1985a)

Aircraft noise is directly related to the power setting. The power setting is dictated by flight conditions, aircraft weight, wind speed, air temperature, etc. Afterburners may be used on take-offs during warm weather. The primary consideration in establishing aircraft power settings is ensuring the safety of the flight. Within that constraint, effort is made to reduce the flight's noise impact on affected communities.

Seymour Johnson AFB is a major Tactical Air Command (TAC) operations base. The noise environment of Seymour Johnson AFB is dominated by the arrival, departures, and flight patterns of Base aircraft.

Noise from ground operations at the Base comes from two basic sources: engine run-up from operational aircraft and ground run-up maintenance operations. Pilots typically go through an engine run-up and check-out procedure before take-off. Routine maintenance of engines requires engine run-up testing. Engine check-out test stands are located towards the center of the base. Engine maintenance run-ups are normally scheduled only during daytime. The Base currently uses noise suppressors to abate engine test stand noise. The Base has begun a program to build "hush" houses which will replace noise suppressors and more effectively attenuate test stand noise.

The primary use of DCR by the 4 TFW is air to ground weapons delivery practice. These operations have a significant impact on the noise level of the range. The noise exposure level at ground level depends on the intensity of aircraft noise which is a function of the power setting, altitude of the aircraft, and the duration time of exposure. During normal range flight operations, aircraft power output can range from minimum approach power up to military power. Aircraft will operate as low as 50 feet above ground level. Formation flying can intensify ground noise exposure.

Maintenance of targets and other facilities requires periodic vehicular traffic onto the range. This traffic has negligible noise impact on the environment.

In addition to the aircraft noise, the range activities involving bombing and strafing will generate noise within local regions. The practice weapons used in these activities are inert ordnance. The strafing operations generate high noise levels due to the firing and to the supersonic velocity of the charges. Inert ordnance contain a smoke spotting charge equivalent to a 12 gauge shotgun shell. These noise levels essentially will be confined to the immediate vicinity of the range targets and therefore should not be an annoyance factor to any inhabited areas in the environs of the range.

3.2.4. Peak A-Weighted and Cumulative Noise

Noise exposure from subsonic flight operations is greatest during low-level aircraft flyover. These noise events are of short duration and are intermittently spaced during the day. The F-15 aircraft on take-off power at 500 feet altitude results in a momentary ground disturbance of 111 dB(A) (Speakman, 1977). For this reason, arrival and departure flight tracks are designed to minimize ground exposure. Flight paths are laid out to avoid, wherever possible, low-level flyover of adjacent communities.

Aircrew training requires low altitude subsonic flights to and from the DCR. These flights follow FAA-approved MTRs. Aircraft currently operate down to 100 feet AGL on certain MTRs (see Table 2.0-3). The impact of subsonic noise can be expected to be the greatest under these particular MTRs. Currently no low-level MTR begins within a 50 mile radius of Seymour Johnson AFB.

There is extensive low-level training on the DCR. Aircraft may operate down to 50 feet AGL during weapons delivery operations while on DCR. Low altitude training missions on approved MTRs to the range may be flown in flights of multiple aircraft. At the approved AGLs of 100 and 300 feet, the noise levels generated by aircraft flyovers can be extremely high, particularly below the flight route. At 300 feet AGL the F-15 aircraft, in cruise power, develops an instantaneous noise level of 93 dB(A) and a SEL of 95 dB(A) (Speakman, 1977).

3.2.5. Area Sensitivities to Noise Impact

Seymour Johnson AFB is surrounded by a number of communities which are sensitive to the noise issue. Affected communities are not limited to those immediately adjacent to the Base such as Goldsboro. Low-level flight operations have brought periodic noise complaints from a number of eastern North Carolina locations including Fremont, Pittsboro, New Bern, Tarboro, Roanoke Rapids, and Clinton.

The Base noise contours as established in the AICUZ document are intended to aid local community planning. The importance of this document is increased by the fact that Department of Housing and Urban Development and Veterans Administration funding assistance is affected by DNL noise ratings (Newman and Beattie, 1985). The city and county of Goldsboro are particularly sensitive to AICUZ noise zoning for this reason.

Since DCR is a restricted area, the noise impact on humans is not a major environmental consideration. However, neighboring areas are sensitive to overflights and associated effects of range operations. Nearby residents are subject to low-level flights of aircraft in transit to and from the DCR. From time to time there has been negative public reaction to ongoing operations.

A number of recreational activities take place in the areas around Seymour Johnson AFB, DCR, and under MTRs. Surrounding areas are used for camping, hunting, hiking, fishing, sightseeing, and other outdoor leisure activities. While recreational use has been recommended as compatible with high noise zones, some recreationists express concern that aircraft noise detracts from their enjoyment of the environment.

Public use of the DCR is restricted. Notable tourist attractions in the immediate vicinity include the Cape Lookout National Seashore, Cape Hatteras National Seashore, Wright Brothers National Monument, Ft. Raleigh Monument, and the Pettigrew State Park. High aircraft noise levels from flyovers can disrupt some recreational activities.

The principal industry of eastern North Carolina is agriculture. There are a number of poultry and swine production facilities in this area. Ranches and farms are common under the MTRs to and from the range. Some farmers have expressed concern in the past over the effects of aircraft noise on grazing, breeding, and herding of livestock and on the behavior of domesticated animals.

3.2.6 Human Health Considerations

The population in and around Seymour Johnson AFB is exposed to the noise generated by the Base ground and flight operations. Because the DCR is restricted from public use, the effect of range operation noise on humans is limited to the personnel operating the range. Overflights and low-level MTRs to and from the range do contribute to the noise environment of neighboring areas. Human effects from exposure to various sound levels are summarized in Appendix B.

The effect of noise on human health can generally be divided into three categories: physiological, behavioral, and subjective. The primary physiological concern with noise is hearing loss. Other physiological concerns have been included as non-auditory effects.

Hearing loss. A considerable amount of data on hearing loss has been collected and analyzed. It has been well established that continuous exposure to high noise levels will damage human hearing (EPA, 1978). The human ear is capable of hearing up to 120 dB over a frequency range of about nine octaves. Hearing loss is generally interpreted as the shifting to a higher sound level of the ear's sensitivity or acuity to perceive sound. This change can either be temporary, TTS (Temporary Threshold Shift), or permanent, PTS (Permanent Threshold Shift; Newman and Beattie, 1985).

Regular exposure to A-weighted sound levels of from 60 to 80 dB for periods of 8 hours will cause some TTS in a significant proportion of the population exposed (Science Applications, Inc., 1980). EPA has set 75 dB(A) for an 8-hour exposure and 70 dB(A) for a 24-hour exposure as the average noise level standard requisite to protect 96 percent of the population from greater than a 5 dB PTS (Science Applications, Inc., 1980). While these standards have relevancy for planning, they in themselves are not necessarily appropriate land use planning

criteria for controlling noise sources because they do not consider cost, feasibility, or the development needs of the community. The results of the three known studies on community hearing loss from exposure to aircraft flyovers near airports showed that there is no danger (under normal circumstances) of hearing loss due to aircraft noise (Newman and Beattie, 1985). Individuals in two of the tests were exposed to a maximum level of 111 dB(A) over 6 hour periods at a flyover rate of 40 events per hour.

Non-auditory effects. There have been a number of studies done to determine whether correlations exist between noise exposure and cardiovascular problems, achievement scores, birth weight, mortality rates, and psychiatric admissions. The non-auditory effect on humans of noise is not as easily proven as the effect on hearing. The results of studies done in the U.S., primarily concentrated on cardiovascular response to noise, have been contradictory (USAF, 1985a).

Cantrell (1976) concluded that the results of human and animal experiments show that average or intrusive noise can act as a stress provoking stimulus. Prolonged stress is known to be a contributor to a number of health disorders. Kryter (1980) states, "It is more likely that noise related general ill-health effects are due to the psychological annoyance from the noise interfering with normal everyday behavior, than it is from the noise eliciting, because of its intensity, reflexive response in the autonomic or other physiological systems of the body. The psychological stresses may cause a physiological stress reaction that could result in impaired health."

It is generally agreed that the level of reaction of residents near airports is directly proportional to the level of noise. Broadbent (1980) indicates increasing levels of noise increases annoyance with a resultant probable increase in the general arousal or excitability of the nervous system. There are many psychological factors which cause differences in human response to the same level of sound energy.

The National Institute for Occupational Safety and Health and EPA commissioned the Committee on Hearing, Bioacoustics, and Biomechanics (CHABA) to study the question of whether established noise standards were adequate to protect against health disorders other than hearing defects. CHABA's conclusion (cited in USAF, 1985a) was: "Evidence from available research reports is suggestive, but it does not provide definitive answers to the question of health effects, other than to the auditory system, of long-term exposure to noise. It seems prudent, therefore, in the absence of adequate knowledge as to whether or not noise can produce effects upon health other than damage to the auditory system, either directly or mediated through stress, that insofar as feasible, an attempt should be made to obtain more critical evidence." CHABA also reported that "many of the available foreign studies could be criticized on a methodological basis (studies were not adequately controlled for other known risk factors)."

Additionally, Dr. Shirley Thompson of the University of South Carolina School of Public Health summarized her research team's "evaluation of the epidemiologic evidence available regarding the effects of noise on the cardiovascular system" in a paper given at the May 1983 meeting of the Acoustical Society of America (a

summary of EPA reports having NTIS designations PB 82-147752, PB 82-147760, and PB 82-147778). Of some 800 potential publications, 83 were chosen for critical review. Each selected article was critiqued independently by an epidemiologist, a cardiologist, and an audiologist. Individual critiques were then integrated for study summary. The conclusion derived by the reviewers plus an additional set of consultants was: "Our analysis indicated that studies to date are inadequate for establishing a cause-effect relationship between noise and cardiovascular research." In terms of adequacy of current research, Thompson summarized the results of the evaluation process as follows: "The relatively poor quality of the identified papers is reflected in the individual component and overall ratings of the reviewers. The proportions of studies meeting more than 50 percent of the evaluative criteria were as follows: On the noise component, 6 percent of the English literature and 11 percent of the translated research; on the health outcome component, 33 percent of the English and 32 percent of the translated research; and on the epidemiologic methodology component, 42 percent of the English literature and 11 percent of the translated studies. When the lowest of the three component scores is taken as the overall validity score, no study reported in the English literature and only one in the translated literature was rated higher than "4" on the 0 to 9 scale. These ratings indicate that the literature is less than fully informative for the task of judging the association between noise and cardiovascular effects." These reports by Thompson represent a milestone in noise research and hopefully a precedent has been set for future evaluations of research in this area.

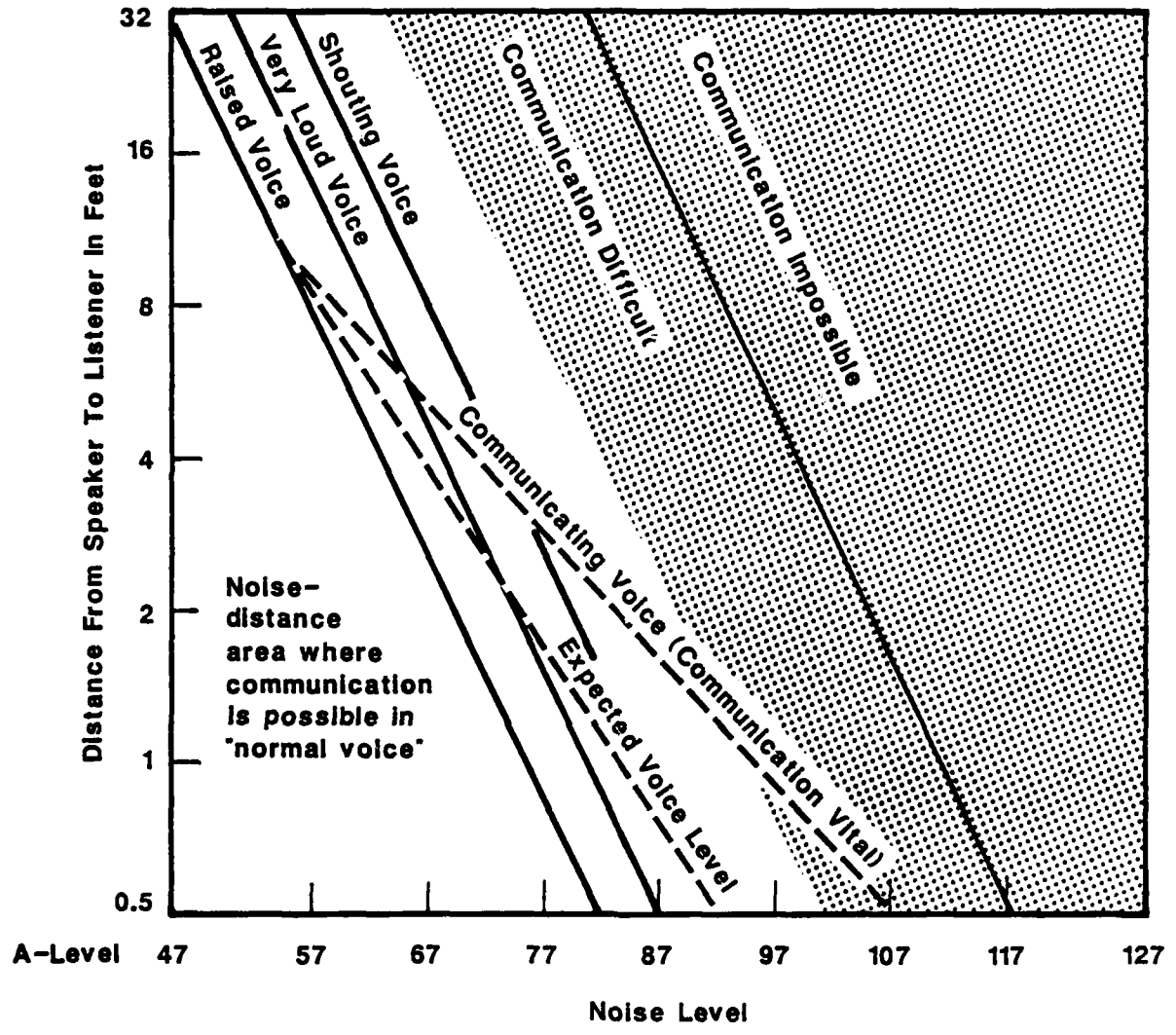
With little reliable evidence and the lack of scientific consensus, any connection between physical or mental health and noise and more particularly, airport noise, has been difficult to establish.

Behavioral effects associated with excessive noise levels include speech and sleep interference and performance loss.

Speech interference. One of the most obvious effects of aircraft noise intrusion is speech interference. The disruption of leisure activities such as listening to the radio, television, music, and conversation is a primary source of annoyance, giving rise to frustration and irritation. In some situations a high degree of intelligibility is essential to safety.

The frequency spectrum of speech covers the range from 100 to 6000 Hz. The intensity level variation of successive sounds is equal to 30 dB. Speech is an acoustical signal characterized by rapid fluctuations in sound level and frequency pattern. It is essential for optimum speech intelligibility to recognize these continually shifting sound patterns. Not only does noise diminish the ability to perceive the auditory signal, but also reduces a listener's ability to follow the pattern of signal fluctuation (Science Applications, Inc., 1980).

A number of studies relate speech interference effects to noise. It has been found that A-weighted sound measures reasonably predict the understanding of speech. Figure 3.2-3 summarizes the effect of A-weighted background noise on speech communication.



SOURCE: AMERICAN SPEECH AND HEARING ASSN. 1969. NOISE AS A PUBLIC HEALTH HAZARD.

FIGURE 3.2-4
NOISE EFFECT ON
SPEECH COMMUNICATION

The EPA (USEPA, 1978) has identified the DNL level of 55 dB as the maximum permissible daily level of intruding noise to allow satisfactory speech communication. It is recognized that single event maximum levels, such as aircraft flyovers can cause momentary speech communication interruption. Table 3.2-2 provides A-weighted peak noise levels for the F-4 aircraft used at Seymour Johnson AFB and on the MTRs.

Sleep interference. Sleep is not a continuous, uniform condition but a complex series of states through which the brain progresses in a cyclical pattern. There are basically five stages of sleep. Arousal from sleep is a function of a number of factors which include: 1) age, 2) sex, 3) sleep stage, 4) noise level, 5) frequency of noise occurrences, 6) noise quality, and 7) presleep activity. Since there are extreme differences in the physiology, the behavior, the habitation and adaptation to noise of individuals, few studies have attempted to establish noise criterion levels for sleep disturbance (Science Applications, Inc., 1980).

Some conclusions on the major determinants of human sleep response to noise drawn by Lukas (1972) include:

(1) Children 5 to 8 years of age are generally unaffected by noise during sleep.

(2) Older people are more sensitive to sleep disturbance than younger people.

(3) Women are more sensitive to noise than men.

(4) Within their own age group, there is a wide variation in the sensitivity of individuals to noise.

(5) Sleep arousal is directly proportional to the sound intensity of aircraft flyover.

While there have been several investigations done to assess the effect of aircraft noise on sleep, none have produced quantitative dose-response relationships in terms of noise exposure level, DNL and sleep disturbance. Noise-sleep disturbance relationships have been developed based on single-event noise exposure. One such study is summarized in Figure 3.2-4.

The threshold level of noise that can cause sleep arousal ranges from 35 to 70 dB(A). Studies show that sleep interference can take place without a person being consciously awakened. The EPA has set 35 dB(A) as the disturbance level for steady noise and concludes that a single event level of 40 dB(A) can result in a 5% probability of awakening (Newman and Beattie, 1985).

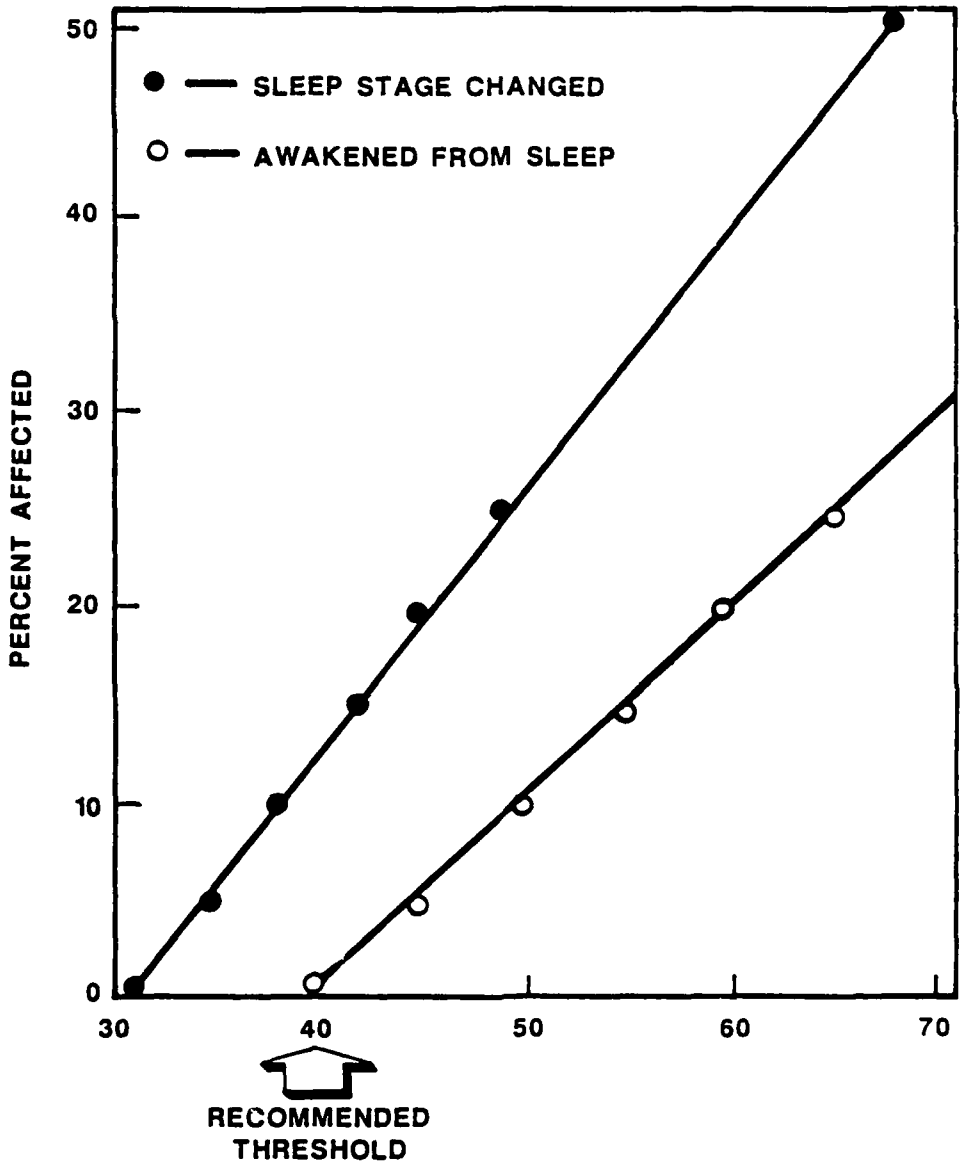
The FAA (1985) has concluded from its research that, "The psychological annoyance from the effects of sleep interference due to aircraft noise is probably more significant than the direct physiological consequences" (Newman and Beattie, 1985). The effects of noise on sleep are not completely

TABLE 3.2-2

A-WEIGHTED PEAK NOISE LEVELS [dB(A)]

Observer to Aircraft Distance (ft)	Aircraft[1]	
	F-4	F-15
100	116	100
300	109	93
500	105	89
1000	98	82

[1] Noise measure for given aircraft at cruise power.



SOURCE: FAA. 1985. AVIATION NOISE EFFECTS, RPT. NO. FAA-EE-85

FIGURE 3.2-5
COMPOSITE OF LABORATORY DATA FOR
SLEEP INTERFERENCE VERSUS
MAXIMUM A-WEIGHTED NOISE LEVEL

understood. There have been few studies done on the short- and long-term after effects such as psychological and physiological disorders or task performance degradation during periods following sleep disturbance. It is agreed that reasonable quality sleep is a requisite for good health.

Performance effects. The effect of noise on the performance of activities or tasks has been the subject of many studies. Some of these studies have established links between continuous high noise levels and performance loss. Noise induced performance losses are most frequently reported in those studies employing noise levels in excess of 85 dB(A). Little change has been found in low noise cases. It has been cited that moderate noise levels, 84 dB(A), appear to act as a stressor for more sensitive individuals performing a difficult psychomotor task (Science Applications, Inc., 1980).

The general effect of noise on performance is just beginning to be suggested from research studies (USAF, 1985a). The results have yet to yield definitive criteria with respect to the effect of periodic aircraft noise on performance. Several general trends that have developed are:

- A periodic intermittent noise is more likely to disrupt performance than steady state continuous noise of the same level. Flyover noise, due to its intermittent nature, might be more likely to disrupt performance than a steady state noise of equal level.
- Noise is more inclined to affect the quality than the quantity of work.
- Noise is more likely to impair the performance of tasks that place extreme demands on the worker.

Annoyance is the primary consequence of aircraft noise. The subjective impression of noise and the disturbance of activities are believed to contribute significantly to the general annoyance response. The feeling of annoyance is a complex response and considered on an individual basis displays a wide availability for a given noise level. Research studies have found greater correlation by examining aggregate community annoyance to noise (Newman and Beattie, 1985).

A number of nonacoustical factors have been identified that may influence the annoyance response of an individual. Newman and Beattie (1985) divided these factors into emotional and physical variables:

Emotional Variables

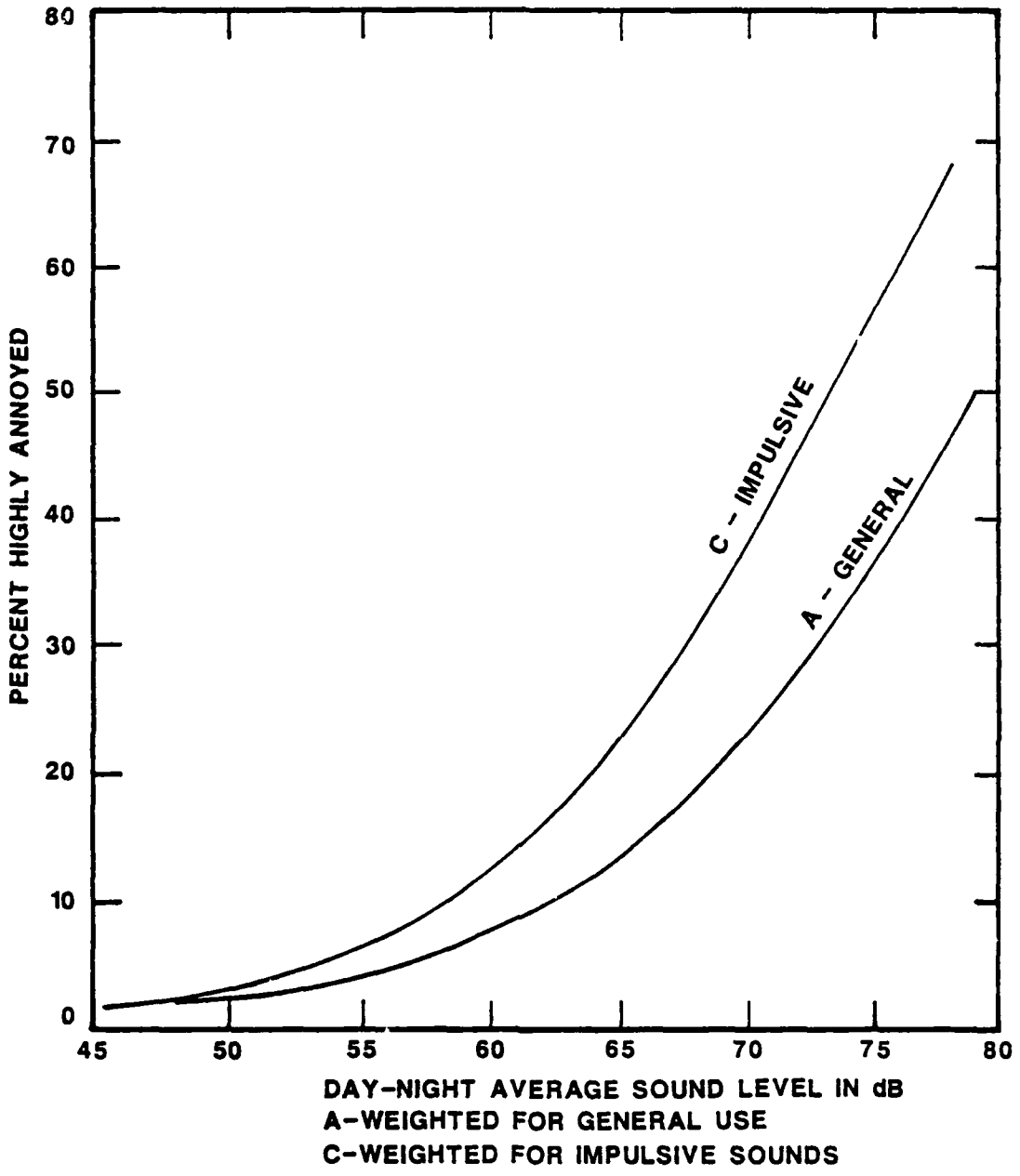
- Feelings about the necessity or preventability of the noise.
- Judgment of the importance and value of the activity which is producing the noise.
- Activity at the time an individual hears the noise.

- Attitude about the environment.
- General sensitivity to noise.
- Belief about the effect of noise on health.
- Feeling of fear associated with the noise.

Physical Variables

- Type of neighborhood.
- Time of day.
- Season.
- Predictability of noise.
- Control over the noise source.
- Length of time an individual is exposed to a noise.

Most of the existing measures of community response to aircraft noise are based on the premise that the degree of annoyance experienced by a community as a whole can be adequately predicted by acoustical models. It has been found that in any community there will be a given percentage of the population highly annoyed, a given percentage mildly annoyed and some who will not be annoyed at all (Newman and Beattie, 1985). Figure 3.2-5 shows the relationship between annoyance, complaints, and community reaction. "The underlying assumption is that noise exposed populations will experience similar reactions of annoyance when exposed to equivalent levels of noise" (Science Applications, Inc., 1985).



SOURCE: CHABA, 1981

FIGURE 3.2-6
RECOMMENDED RELATIONSHIPS FOR PREDICTING COMMUNITY RESPONSE TO HIGH-ENERGY IMPULSIVE SOUNDS AND TO OTHER SOUNDS

3.3. Physical Environment

Seymour Johnson AFB occupies 3,238 acres in the center of Wayne County. A total of 1,320 acres of the Base is designated as improved grounds, 655 acres as semi-improved land, 485 total acres as unimproved grounds (forest land), and 778 total acres are under facilities and pavements.

Wayne County is considered to be the center of the rich coastal plains farming region of North Carolina. It is centrally situated between the South Carolina and Virginia lines and between the Atlantic Ocean and the rolling piedmont region.

The land beneath the Echo MOA includes the western half of Wayne County, most of Johnson and Sampson Counties and small portions of Harnett and Duplin Counties. Approximately one million acres of land area lies below the Echo MOA.

Dare County is in the northeastern portion of North Carolina which is part of the Atlantic Coastal Plain (see Figure 3.0-2). Dare County has an area of approximately 1246 square miles of which 858 are water and 388 are land (Peacock and Lynch, 1982). The county encompasses a variety of habitats such as pocosins, wooded swamps, freshwater marshes, brackish sounds, embayed rivers, open lakes, minor areas of upland mixed pine-hardwood forests, and various marine habitats on the Outer Banks.

Dare County is unique in North Carolina because it is composed of three distinct and separate landforms: the mainland, Roanoke Island, and the Outer Banks. Mainland Dare County is a peninsula bounded on the north by the Albemarle Sound, on the east by the Croatan Sound, on the west by the Alligator River, and on the south by the Pamlico Sound and River. The mainland county's coastline is dissected by small embayed streams. East Lake and South Lake are located in the northern part of the county and the Long Shoal River is located in the southern part of the county. Whipping Creek and Milltail Creek are non-embayed streams that drain the western part of the county, and Callaghan Creek drains part of the eastern side. Small blackwater lakes such as Milltail Lake, Whipping Creek Lake, and Lake Worth are scattered along the county's interior. The range is located in the southern portion of mainland Dare County.

The MTRs traverse a variety of land forms from northeastern South Carolina to southern Virginia and from western South Carolina to west of Chattanooga, Tennessee. These areas encompass developed and undeveloped lands of the mountains, piedmont, and coast.

3.3.1 Geology

All of Wayne County, including Seymour Johnson AFB, is located in the Coastal Plains Province. In the area of Seymour Johnson AFB, a surficial sand of the Post Miocene Age occurs. Underlying this sand is the Black Creek formation of the Late Cretaceous Age. The Black Creek formation, which thickens toward the southeast, consists of black or dark-gray thinly laminated clay and lenses of sand. It contains abundant mica and lignite, as well as iron sulfides in the

form of marcasite or pyrite which occur as concretions, disseminated grains, or as a replacement mineral in lignitized wood fragments. The lower part of the formation contains minor amounts of glauconite and, occasionally, foraminifera.

Underlying the Black Creek formation is the Cape Fear (or Tuscaloosa) formation. The Cape Fear formation in the Seymour Johnson AFB area is composed of gray to white sand and gravel and lenses of clay. Quartz is the major constituent of the sand and gravel; feldspar ranges from 0 to 5 percent in most samples. The Cape Fear is a basal sedimentary formation which occurs in all but the northwestern corner of Wayne County. The formation dips southeastward at 12 to 15 feet per mile and thickens to the southeast. The basement rock in Wayne County is chiefly slate. The basement surface is uneven and slopes to the southeast (Pusey, 1960).

The DCR is located in the Atlantic Coastal Plains physiographical flatwoods region (USAF, 1976). The entire area of mainland Dare County is located on the Pamlico surface or Pamlico terrace. The Pamlico is the youngest and the lowest of the several generalized surfaces of North Carolina's Coastal Plain recognized as having been formed during periods of higher sea level (Peacock and Lynch, 1982).

About 75,000 years ago, during the Pamlico transgression, the ocean's edge lay inland to a point now marked by the sandy ridge of the Suffolk Scarp. The toe of the scarp is currently about 45 miles west of the western shore of the Dare mainland and approximately 20 feet above modern sea level (Peacock and Lynch, 1982).

3.3.2. Topography and Drainage

Seymour Johnson AFB is located to the southeast of the City of Goldsboro and in the center of Wayne County. The Goldsboro area is located within the Inner Coastal Plain section of the Atlantic Coastal Plain Physiographic Province. The Coastal Plain Province is characterized by a 70-to-100-mile wide belt of flat to gently rolling lowlands, extensive surficial dissection and mature streams. Relief in the Coastal Plain section ranges from less than 20 feet to 100 feet and the elevation ranges from 70 to about 150 feet MSL.

The upland surface of Wayne County is generally flat and slopes toward the southeast. Maximum relief in the county occurs in and adjacent to the stream valleys of the major rivers. For example, at the Cliffs of the Neuse State Park, in the southeast corner of the county, the relief adjacent to the Neuse River is about 100 feet.

The land surface at the Seymour Johnson AFB tends to slope in a southwesterly direction toward the Neuse River. The surface elevation at the northeast portion of the base is slightly above 100 feet MSL and at the southwest portion, within the Neuse River floodplain, the elevation is as low as 55 feet MSL.

All surface drainage from Seymour Johnson AFB eventually flows into the Neuse River. The surface runoff may either enter the river directly, or flow to the

river via Stoney Creek on the northern perimeter of the base or via an open drainage channel on the southern side of the base. The drainage channel collects the drainage from a ditch on the south side of the runway.

The State of North Carolina has designated both the Neuse River and Stoney Creek in the area near the base as Class C waters. A "C" classification means that the water has been determined to be suitable for fishing and fish propagation, and any other usage requiring waters of lower quality.

The Neuse River, Stoney Creek, and the drainage channel have been routinely monitored by base personnel. A small increase in the oil and grease, chemical oxygen demand, and total dissolved solids (TDS) concentrations have been detected in the Neuse River within the reach of the base boundaries. The increase may be attributed to runoff from the ditch adjacent to the runway and/or from the discharge of treated wastewater from the City of Goldsboro treatment facility which occurs within this same section of the river (USAF, 1982).

The entire Wayne County area (including surrounding counties) is drained by streams flowing southeastward. The larger streams of the area tend to meander and the stream valleys are wide and shallow. Within the Coastal Plain Province the gradient of the Neuse River is about 1.0 to 1.5 feet per mile.

The Neuse River, rising in Durham County, drains approximately 2,400 square miles by the time it reaches Goldsboro. Thus, stream flow, recorded at Goldsboro, is very high. For the period 1930-1965, the minimum flow recorded 51,840,000 gallons per day. The average recorded flow is 1,674,432,000 gallons per day.

Wayne County is almost entirely located within the Neuse River Basin. Within the confines of the basin boundaries all surface water is eventually drained, directly or indirectly, into the Neuse River, and finally into the Atlantic Ocean.

The flood plain of Neuse River is about three miles wide in the vicinity of Goldsboro. The City of Goldsboro, Seymour Johnson AFB, and the State's Cherry Hospital complex are subject to the greatest flood damages in the basin. The U. S. Geological Survey has a stream gauge near Goldsboro on the Neuse River, which has been operational since February 1930. Sixty percent of the floods on the Neuse River near Goldsboro have occurred in the spring; however, the floods of major importance were associated with tropical storms and occurred during September and October. The recorded maximum occurred on October 5, 1929, reaching a peak discharge of 38,600 cfs and cresting 13.3 feet above the flood stage of 14 feet. The construction of flood control dams in the early 1980's in the Wake County area has significantly decreased the chances of a major flood in the Seymour Johnson environs.

Since Air Force activity in the Echo MOA also would affect most of Johnson and Sampson Counties to the northwest and southwest of Wayne County respectively, a brief description of the topography and drainage of these counties follows.

Elevations in the northern part of Johnson County Range from 250 to 400 feet MSL and the upland surface slopes southeastward at about 10 feet per mile. Elevations in the southern part of the county range from 150 to 250 feet MSL and the upland surface slopes southeastward at a rate of about 3 feet per mile. The major streams in Johnson County flow toward the southeast and with their tributaries form a parallel drainage pattern. The stream gradients are gentle and the streams meander in the Coastal Plain. The topography of Sampson County is flat to gently rolling and the upland surface slopes gently toward the southeast. The flat to gently-rolling surface is dissected by streams whose valleys are about 80 feet deep in areas of maximum relief.

The DCR is located within the Atlantic Coastal Plain which occupies the eastern two-fifths of North Carolina. The area slopes mildly from the fall line, which marks the transition from the Piedmont Region to the Coastal Plain, to the coast. Elevations on mainland Dare County are 12 feet or less (Peacock and Lynch, 1982).

Runoff from natural areas such as the DCR tends to be spread over a broad area rather than draining through a well-defined drainage network. As with area farm land, ditches and canals have been constructed around portions of the DCR to allow surface drainage by gravity flow. The catchment canals flow into transport or outfall canals that lead to a local drainage outlet (creek, river, or estuary). The principal transport canal leaving the DCR area has provisions to control the outflow of water.

3.3.3. Soil Characteristics

The soils on which the Seymour Johnson AFB is located have been generally classified as belonging to one of four soil associations. The northeast portion of the Base is on soils of the Rains-Torhunta-Liddell association. The center of the Base consists of soils of the Norfolk-Goldsboro-Arcock association and, at the southwest end, Wickham-Johns association soils occur. Finally, along the Neuse River and Stoney Creek the soils are of the Johnston-Chewacla-Kinston association.

The Rains-Torhunta-Liddell Association consists of poorly to very poorly drained, nearly level soils that have a friable and very friable sandy clay loam to sandy loam subsoil, located on uplands and terraces. This association makes up about 15 percent of Wayne County.

The Norfolk-Goldsboro-Aycock Association consists of well drained and moderately well drained, nearly level to sloping soils that have a friable sandy loam to clay loam subsoil, located on uplands. This association makes up about 37 percent of Wayne County.

The Wickham-Johns Association consists of well-drained to somewhat poorly drained, nearly level to gently sloping soils that have a friable sandy loam to clay loam subsoil, located on terraces. This association makes up about 5 percent of Wayne County.

The Johnston-Chewacla-Kinston Association consists of poorly drained to somewhat poorly drained, nearly level soils that have a friable sandy loam to clay loam subsoil, located on flood plains along the major streams. This association makes up about 8 percent of Wayne County (USDA, 1974).

The soils of mainland Dare County vary in amount, kind, and depth of organic matter on the surface and texture of mineral subsoil, but they are commonly characterized as having a shallow water table much of the year and higher than normal levels of organic matter in the surface layer. The soil characteristics of Dare County are detailed in Table 3.3-1. The deepest Histosols border the Alligator River and also occupy pre-peat drainage channels in the interior of the county (Peacock and Lynch, 1982). Shallow Histosols generally adjoin deeper peats in the soilscape. Mineral series occur in areas which were local interstream divides on the pre-peat surface. Organic deposits currently obscure the pre-peat topography.

3.3.4. Subsurface Conditions

Groundwater generally exists in the upper sands at shallow depths in an undefined "upper aquifer." This phenomenon has been observed by the Soil Conservation Service (USDA, 1974) who noted that groundwater was usually present within six feet of ground surface in many of the soil units mapped at the Base. It is assumed that water is unconfined in this unit.

Extensive test drilling has been done in the search for additional water supplies of suitable quality for Seymour Johnson AFB. At present, the main well field is located at the southern corner of the base adjacent to the Neuse River where eleven wells have been drilled (USAF, 1985b). Seymour Johnson AFB derives 70 percent of its water from these wells; the remaining 30 percent is purchased from the city. The wells were drilled into the basement rock but are cased only to the top of the basement rock at depths of from 150 to 190 feet. Water is obtained from both the Black Creek and Cape Fear Formations.

Except for the municipal supply in Goldsboro, all municipal and domestic water supplies in Wayne County are obtained from wells. Surficial sand supplies water to domestic wells in the area south of the Neuse River. The water is soft but commonly is corrosive to metals, and contains objectionable amounts of iron (Pusey, 1960).

Except for public supply of Smithfield, all public and domestic water supplies in Johnston County are obtained from wells.

All water supplies in Sampson County are obtained from wells. Most domestic wells are dug or bored and obtain water from the surficial sand which supplied water to about 75 percent of the people in the county. The water from the surficial sand is soft, corrosive to metals, and high in iron content.

TABLE 3.3-1

SOIL CHARACTERISTICS OF DARE COUNTY

SOIL GROUP	SOIL SERIES NAME	SOIL DESCRIPTION
Very Poorly Drained Mineral	Hyde	Mineral soil with fine silty subsoil
	Cape Fear	Mineral soil with clayey subsoil
Histic Epipedon (Organic Depth 8-16")	Roper	Organic depth 8-16", Friable organic over fine silty textured mineral
	Pettigrew	Organic depth 8-16", Friable organic over clayey textured mineral
Histosols (Organic Depth 16-51")	Ponzer	Organic depth 16-51", Friable, black organic over loamy textured mineral
	Kilkenny	Organic depth 16-51", Weak colloidal, black, woody organic over loamy textured mineral
	Belhaven	Organic depth 16-51", colloidal, reddish brown, loggy organic over loamy textured mineral
	Mattamuskeet	Organic depth 16-51" colloidal, reddish brown, loggy organic over sand or loamy sand textured mineral
Histosols (Organic depth greater than 51")	Pungo	Organic depth greater than 51", colloidal, loggy, reddish brown organic over loamy textured mineral
	Dare	Organic depth greater than 51", colloidal, loggy, reddish brown organic over sand or loamy sand textured mineral

Source: Barnes, 1981.

The saturated hydraulic conductivity of soils in the Dare County area may be as low as 0.0039 in./hr (0.01 cm/hr; Richardson, 1981). In winter months, the water table is very close to the surface because of these very low internal conductivity rates. During warmer months, the water table is lowered due to the effects of evaporation and transpiration causing the deep peat soils to dry and become susceptible to fires.

The natural pH of organic soils in the Dare County region is acidic and most commonly found to be 3.5 to 4.1 (Richardson, 1981). The soils are acidic because they are formed from mineral materials with a low base saturation. The geographic area has a warm, humid climate with rainfall exceeding the evapotranspiration rate by approximately 15 in. (38 cm) which has been conducive to leaching of the basic elements from the soil strata.

3.3.5. Unique Physical Features

No unique physical features occur on or around Seymour Johnson AFB.

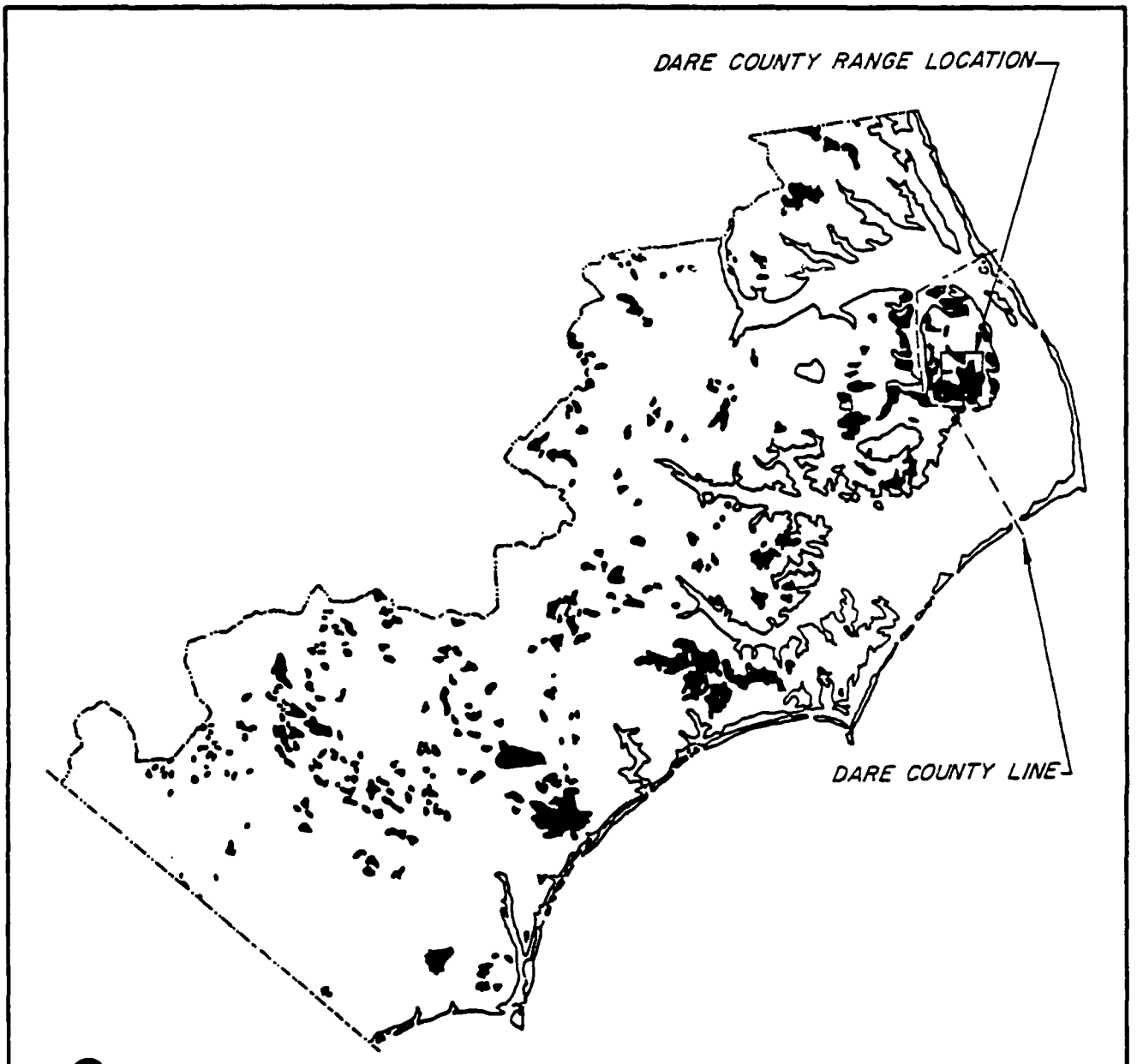
Pocosin is the traditional name for a unique type of fire-adapted shrubby wetlands found on the Atlantic Coastal Plain from Virginia to Georgia but most extensively developed in North Carolina (Ash et al., 1983). As may be seen on Figure 3.3-1, pocosins are located in the DCR area. Pocosins are among the last remote regions of eastern North Carolina. These areas are difficult to penetrate due to the extremely thick underbrush. Pocosins provide a natural habitat for many species of wildlife that seek refuge in the dense underbrush.

3.3.6. Special Use Areas

The Cliffs of the Neuse State Park are located about 8 miles southeast of the Seymour Johnson AFB off State Highway 111. The 608-acre state park is adjacent to the Neuse River where the river has eroded the landscape to form cliffs of up to 100 feet above the river.

Two other special use areas are located within the land-projected boundaries of the Echo MOA. Bentonville Battlefield, located in the southern part of Johnston County, is the site where the last major Confederate offensive of the Civil War (the largest battle ever fought in North Carolina) occurred. The other area, Laurel Lake Gardens, is in Sampson County. On display at these gardens is an extensive planting of ornamental plants and flowers.

Riverside Campground, located in Hyde County near the township of Leechville, North Carolina, is within the land-projected boundaries of MTR IR-012. Other special use areas near or under proposed MTRs include wildlife refuges and management areas, national forests, parks, and other recreation areas (see Section 3.4.4).



SOURCE: RICHARDSON, 1981

FIGURE 3.3-1
EXTENT OF NATURAL OR SLIGHTLY MODIFIED POCOSIN IN 1980

3.3.7 Water Resources

Seymour Johnson AFB is supplied by a group of eleven (11) wells (see Section 3.3.4). These wells are located on the southern corner of the Base adjacent to the Neuse River. The casings for these wells generally extend from 150 to 190 feet to the top of the basement rock in this region. The water is withdrawn from both the Black Creek and Cape Fear formations. The remaining 30 percent of the water supplied for use on the Base is purchased from the City of Goldsboro.

The water that is supplied from wells located on the Base is used for light industrial activities as well as domestic use for approximately 200 new housing units. The water supplied by the City of Goldsboro is only for domestic use for a number of older housing units. Base water usage in 1986 ranged from a peak of 2.3 million gallons per month to a minimum of 746,000 gallons per month.

Seymour Johnson AFB does not operate a wastewater treatment plant. All wastewaters generated on the Base, whether from industrial or domestic activities, are accepted by the City of Goldsboro for treatment prior to discharge to the Neuse River. None of the industrial activities at Seymour Johnson AFB require wastewater pretreatment prior to discharge to the Goldsboro wastewater treatment plant. Therefore, no wastewater treatment sludges are generated by Seymour Johnson AFB activities.

Wastewater discharge volume for Seymour Johnson AFB is estimated at 70 percent of the total water used on Base. On this basis, peak wastewater discharge was 1.6 million gallons per month and minimum discharge was 521,500 gallons per month during 1986.

3.4. Biological Environment

3.4.1 Plant Communities

The grounds of the Seymour Johnson AFB can be grouped into four categories, 1,320 acres of improved grounds, 655 acres of semi-improved grounds, 485 acres of unimproved grounds, and 778 acres under facilities. The major types of vegetative cover that occur in each of the first three categories are delineated below.

The plant communities that cover the improved grounds are 50 percent common bermuda grass, 10 percent Kentucky-31 fescue, 10 percent kobe lespedeza, 10 percent crabgrass (native), and 20 percent white dutch clover.

The semi-improved grounds are divided into two categories according to mowing height. There are approximately 223 acres in the 3 to 5 inch mowing height category. The remaining acreage is airfield ground which lies within the runway border area, specifically within the general cantonment area. The existing vegetation for semi-improved grounds consists of 50 percent bermuda grass, 15 percent tall fescue, 10 percent lespedeza, 5 percent white clover and crabgrass.

Plant communities that occur on the unimproved grounds include communities similar to those on the improved and semi-improved grounds, in addition to wooded areas that consist primarily of pine and oak trees.

The land area beneath the Echo MOA includes approximately one million acres. The majority of this land is located in Wayne, Johnston, and Sampson counties. The land is predominantly either rural farmland or hardwood and pine forests. Some of the land is similar to the improved and semi-improved grounds of the Base.

The ten MTRs proposed to be utilized by the F-15E mission extend over several states from coastal to mountain regions. Therefore, the land area located beneath the MTRs support a wide variety of plant life. Due to the extensive area and the wide variety of habitats located under the MTRs, discussions regarding plant communities occupying land areas underneath the MTRs will be limited to sensitive areas and to plant species that are of special concern, rare, or endangered.

Peat bogs and wooded swamps form most of the vegetative community in mainland Dare County. The major plant communities associated with the DCR are the shrub pocosin, low tree pocosin, medium high tree pocosin, cane pocosin, mixed pine hardwood swamp, hardwood swamp, white cedar swamp and disturbed areas. Detailed lists of the specific plants can be found in the Fish and Wildlife Management Plan for Dare County Bombing Range, North Carolina (Noffsinger and Durda, 1985).

The shrub pocosins occur primarily in the eastern portion of the DCR. Scattered, stunted pond pines usually less than 17 feet (5 meters) in height occur, but the shrub layer is the dominant feature of this community. Bitter

gallberry and fetterbush dominate the shrub layer. Virginia chain-fern is the most abundant herbaceous plant.

The low tree pocosin community is very similar to the shrub pocosin but with a few more and slightly larger pond pines present. It also occurs primarily in the eastern half of the DCR. Red bay and loblolly bay also reach above 17 feet (5 meters) in height. Fetterbush and bitter gallberry are the dominant shrubs. Unlike the shrub pocosin, neither grasses nor sedges are present in significant amounts.

The medium tree pocosin community also occurs primarily in the eastern half of the DCR, however it is found further west than the shrub and low tree pocosin. The tree canopy is much more significant than in the shrub and low tree pocosin. A very significant shrub layer exists even though the tree canopy is much more closed than the shrub and low tree pocosins. Pond pine and red bay are the dominant canopy species, with fetterbush and red bay being the dominant shrubs. Other than scattered clumps of cane, herbaceous cover is lacking.

Pond pine is the dominant canopy tree in the cane pocosin community with only small amounts of sweetbay and red maple present. On the DCR this community occurs primarily in the center of the range north of the target area. A cane understory provides the dominant herbaceous cover.

The dominant trees in the mixed pine hardwood swamp community are red maple, red bay, and black gum. The dominant shrubs are fetterbush, bitter gallberry, and red bay. Little or no herbaceous vegetation exists. This community is found on the western side of the range primarily in the northwestern corner.

The dominant species in the hardwood swamp community include red maple, black gum, and red bay. Dominants in the shrub layer are red bay and fetterbush. The hardwood swamps on the range, particularly in the southwestern corner, contain a significant amount of cypress not now found in many of the stands in other parts of Dare County. Tree heights and diameters are also consistently greater for these hardwood swamp than for other areas of the county.

The dominant tree for the white cedar swamp community is white cedar, but black gum is an important subdominant. The shrub layer can be very dense and is dominated by sweet gallberry and fetterbush. Virginia chain-fern is the only herbaceous plant present in substantial amounts. Cypress also is found in white cedar stands on the range.

For disturbed areas where timber has been harvested intensively, a closed canopy is usually achieved within 7 to 10 years after cutting. Some areas have been clear cut while other areas have scattered large trees present. These scattered large trees are predominantly red maples. The shrub layers are dominated by sweet pepperbush, red maple, bitter gallberry, sweetgum, fetterbush, and wax myrtle. Greenbrier and yellow jassamine are the most common vines. Cane, broomsedge, other grasses, sedges, and forbes are common. Common rush, spikerush, sedges, and cattails are found in wetter areas and in ruts, skid trails, and holes created by logging equipment. Air-to ground training for the

F-15E also will be conducted on Range BT-11 which is located in Carteret County. The land area of Range BT-11 and the immediate vicinity is similar to the land area of the DCR. Therefore plant communities at Range BT-11 are similar to those communities found at the DCR. The land area in the immediate vicinity of Range BT-11 also supports freshwater and saltwater marshes that contain cattail, bulrush, sawgrass, and Black needlebrush.

3.4.2. Wildlife Communities

Bird activity at Seymour Johnson AFB is influenced by the variety of available habitats including short grassy and/or denuded areas, tall grass, marsh, pines and mixed hardwoods, agricultural areas, and fixed facilities. A four-acre wooded area approximately four miles north of the Base promotes bird activity on the Base. In grassy areas of the Base, Starlings, House Sparrows, Horned Larks, Robins, and Eastern Meadowlarks have been observed foraging and drinking. The Fish and Wildlife Management Plan for Seymour Johnson AFB (Smith, 1984) contains a listing of land and shore birds, and waterfowl that are indigenous to Wayne County and those that have been sighted on the Seymour Johnson AFB.

Water sources on or adjacent to the Base include sewage ponds at the west end of the runway, an intermittent stream that runs parallel to and south of the runway and discharges into the Neuse River, a golf course lake, and the intermittent water impoundments on the airfield. The sewage ponds and their environs provide suitable habitat for waterfowl, gulls, herons, hawks, vultures, crows, and doves. As many as 200 waterfowl have been observed wintering in this area. The presence of these birds poses a potential hazard for aircraft operations to or from the east should the birds fly into the flight path of an aircraft during landing or takeoff. The intermittent stream is flanked by young trees and underbrush. Bobwhite Quail have been observed in this habitat.

Crows, Red-winged Blackbirds, woodpeckers and cardinals have been observed among the pine and mixed hardwood trees at the west end of the runway near the sewage pond. At least one sighting of a Marsh Hawk in the treeline at the east end of the runway has been recorded.

Agricultural areas south of the runway include field crops (soybeans, corn, and tobacco), hay farms, a grain elevator, and a feedlot. Boat-tailed Grackles have been observed in the feedlot. These food sources could support large bird populations. Suitable roosting sites can be found on the Base environment in proximity to these feeding sites.

The small game habitat of the unimproved grounds of the Base also is an attractive environment for a variety of fauna. The featured wildlife species associated with this habitat is the squirrel. Squirrels have thrived in the wooded area of the Base. They are so abundant in the family housing section of the Base that they have proven to be a problem by causing shorts in the Base electrical system.

The land area located beneath the Echo MOA supports many of the same wildlife species that occur on the Base. In addition to those species, owls, whitetail deer, raccoon, fox, and rabbit are present.

For the same reasons as discussed in Section 3.4.1 for plant communities, discussions regarding wildlife species occupying land areas beneath the MTRs will be limited to those present in sensitive areas and those that are of special concern, rare, or endangered.

The most recent work concerning wildlife at the DCR is contained in the Fish and Wildlife Management Plan for the DCR (Noffsinger and Durda, 1985). This plan covers the fish and wildlife found on the 46,621 acres of the range. It is estimated that the active portion of the range contains approximately 6,100 acres and the remaining 40,500 acres are available for fish and wildlife management. The plan divides the range into habitat types and water bodies as follows:

Habitat Type/Water Body	Approximate Acreage
Shrub pocosin	12,829
Cane pocosin	2,863
Low tree pocosin	8,782
Medium and high tree pocosin	2,943
Mixed pine/hardwood swamp	6,080
Hardwood swamp	9,329
White cedar swamp	1,813
Disturbed (primarily recent logged areas)	1,496
Whipping Creek	10
Whipping Creek Lake	328

Noffsinger and Durda (1985) describe each habitat type and associated vegetation based on line intercept data from stratified random samples for mainland Dare County.

A summary of the fish and wildlife habitat may be found in Appendix C. There are diverse species of fish and wildlife present in the DCR area which is reflective of the varied habitats available. Tables which list the fish, reptiles, amphibians, birds, and mammals indigenous to the DCR can be found in Noffsinger and Durda (1985). These species include small birds, owls, herons, bobwhite, egrets, hawks, osprey, ducks, and other waterfowl, alligators,

numerous snakes, turtles, frogs, rabbits, rodents, bobcat, black bear, squirrels, fox, racoon, opossum, and otter.

The wildlife species that occupy land on and near range BT-11 are similar to those found on the DCR.

3.4.3. Rare and Endangered Species

The following species of Federally-listed endangered (E) and threatened (T) species may occur within the impact area of the proposed action (L.K.M. Gautt, December 1987, U.S. Fish and Wildlife Service, Field Supervisor, personal communication):

- Bald eagle (Haliaeetus leucorephalus) - E
- Red-cockaded woodpecker (Picoides borealis) - E
- Kemp's ridley sea turtle (Lepidochelys kempii) - E
- Leatherback sea turtle (Dermochelys coriacea) - E
- Artic peregrine falcon (Falco peregrinus tundrius) - T
- Loggerhead sea turtle (Caretta caretta) - T
- Green sea turtle (Chelonia mydas) - T
- Piping plover (Charadrius melodus) - T

In addition, there are species which, although not now listed or officially proposed for listing as endangered or threatened, are under status review by the Service. These include:

- Carolina gopher frog (Rana areolata capito)
- American swallow-tailed kite (Elanoides forficatus forficatus)
- Carolina lilaeopsis (Lilaeopsis carolinensis)
- Sensitive joint-vetch (Aeschynomene virginica)
- Pine barrens treefrog (Hyla andersonii)
- Carolina madtom (Noturus furiosus)
- Riverbank sand grass (Calamovilfa brevipilis)
- Nestronia (Nestronia umbellula)

There are three species of rare and endangered wildlife that live within the boundaries of Seymour Johnson AFB and under Echo MOA. Those species are the Neuse River Waterdog, the Red-cockaded Woodpecker, and the Peregrine Falcon (USAF, 1984). The only plant species in the area that have been determined to be endangered or threatened are the Spring-flowering Goldenrod (Solidago verna) and the Wireleaf Dropseed (Sporobolus teretifolius). These plants are indigenous to Johnston and/or Sampson Counties .

The Neuse River Waterdog is the only endangered animal or animal of special concern that is known to be a resident of the Base. The Base is bordered by the Neuse River. Stoney Creek flows through the Base before discharging into the Neuse River. Both of these bodies of water have known populations of the waterdogs. The Neuse River Waterdog is adversely impacted by the degradation of its aquatic environment. In order to protect the habitat of the waterdog, the Base has initiated action in an effort to prevent the discharge of any waste

materials from the Base that could possibly degrade the water quality of the Neuse River or Stoney Creek. The Base has a Hazardous Waste Management Plan which requires that all hazardous waste generated by the Base be stored and disposed of in accordance with State and EPA regulatory requirements. The Base also has an Oil and Hazardous Substance Pollution Contingency Plan to address the prevention, containment, and cleanup of any accidental spills of oil or hazardous materials. The Base Bioenvironmental Engineer monitors the effectiveness of these programs.

The Red-cockaded Woodpecker (Picoides borealis) is resident throughout most of the southeastern United States. They require old growth pine stands and live in trees that have developed red heart disease. Destruction of mature pine stands will cause the bird to leave an area. Developmental activities in the immediate vicinity also could cause birds to leave the area. Seymour Johnson AFB was surveyed in 1983 to locate areas where the Red-cockaded Woodpecker might reside. No indication that this species lives on the Base was observed. Nesting sites could occur within the land-projected boundaries of Echo MOA.

The Peregrine Falcon (Falco peregrinus) does not have any breeding population in the State of North Carolina, but there are some modest populations during the winter. The birds that visit the area are migrants that fly between Greenland and South America. Seymour Johnson AFB and Echo MOA may be an infrequent host to the bird, but the land is not critical to the falcon's habitat. A sighting of the bird was made in early 1982 about three miles from the Base.

The major threat to the Peregrine Falcon comes from the toxic agricultural chemicals. The Peregrine Falcon has been adversely impacted in the past as a result of the application of certain agricultural chemicals, especially pesticides. Pesticides have the potential to concentrate in the bird's reproductive tissues greatly reducing breeding success. The discontinued use of some of the more toxic pesticides has resulted in improved survival rates for many of the predatory birds. Seymour Johnson AFB has developed a well-managed entomology program to ensure that pesticides are applied only as necessary. There is little that Seymour Johnson AFB can do to promote the falcon's population beyond the measures already taken.

Additional animal species occurring within the Echo MOA area that have been determined to be endangered, threatened, or of special concern and are indigenous to Johnston and/or Sampson Counties are the Roanoke Bass (Ambloplites cavifrons), Atlantic Pigtoe (Fusconaia masoni), a crayfish (Procambarus medialis), American Alligator (Alligator mississippiensis), Broadtail Madtom (Noturus new species A), and Crawfish Frog (Rana areolata).

The following Federally-listed threatened or endangered wildlife were found by Noffsinger and Durda to occur within a 50-mile radius of the DCR:

- Red-cockaded Woodpecker (Picoides borealis)
- American Alligator (Alligator mississippiensis)
- Bald Eagle (Haliaeetus leucocephalus)
- Peregrine Falcon (Falco peregrinus)

The Red-cockaded Woodpecker and American Alligator are actually present on the DCR. Local residents and range personnel have reported sightings of the Eastern Cougar (Felis concolor cougar). The Loggerhead Turtle (Caretta caretta), Green Turtle (Chelonia mydas), and the Ridley (Lepidochelys kempi) also have been identified by the North Carolina Natural Heritage Program as Federally-listed species present in Dare County. Additionally, the North Carolina Natural Heritage Program has identified those plant and wildlife species listed in Table 3.4-1 to be present in Dare County and has assigned a state status rating for each. Many of these plant and animal species that are of special concern, rare, or endangered and that occur in Dare County also are present on or near Range BT-11 and can occur under the proposed MTRs.

3.4.4. Sensitive Areas

There are no biologically sensitive areas such as wildlife refuges in the vicinity of Seymour Johnson AFB or the Echo MOA. The Base is bordered by the Neuse River and Stoney Creek traverses the Base property. Both streams provide suitable habitat for the Neuse River Waterdog (see Section 3.4.3) and known populations exist in both streams. Sensitive aquatic habitats under the Echo MOA airspace support fish, crayfish, alligator, and frog species considered to be of special concern (see section 3.4.3).

The following sensitive areas are located within a 40 mile radius of the DCR; see Figures 3.0-2 and 3.0-3) and are traversed by or adjacent to the proposed MTRs:

- Pungo National Wildlife Refuge
- Pea Island National Wildlife Refuge
- Swanquarter National Wildlife Rufuge
- Mattamuskeet National Wildlife Rufuge
- Alligator River National Wildlife Refuge
- Cape Hatteras National Seashore
- Cape Lookout National Seashore
- Cedar Island National Wildlife Refuge
- Pee Dee National Wildlife Refuge
- Carolina Sandhills National Wildlife Refuge (located in South Carolina)

The Pungo National Wildlife Refuge was established in 1963 and is located in Washington and Hyde Counties, North Carolina. The refuge has approximately 12,230 acres comprised of freshwater marshes, timber, farmland, and Pungo Lake. Pungo Lake covers about 2,800 acres and is the main topographic feature and waterfowl attraction.

The Pea Island National Wildlife Refuge was established in 1938 on the Outer Banks of North Carolina. The refuge has approximately 5,900 acres of beach, ocean dunes, and tidal marsh. In addition to this, there are 25,700 acres of waters in the Pamlico Sound that are closed by Presidential Proclamation to waterfowl hunting.

TABLE 3.4-1

PLANT AND ANIMAL SPECIES OF CONCERN

Name	State Status
Plant Species[1]	
Toothed-leaf Flatsedge (Cyperus dentatus)	PP
Woolly Beach Heather (Hudsonia tomentos)	SRS
Carolina Lilaeopsis (Lilaeopsis carolinensis (=L. attenuata))	T
Southern Twayblade (Listera australis)	SRS
Winged Seedbox (Ludwigia alata)	SRS
Lanceleaf Seedbox (Ludwigia lanceolata)	SRS
Tiny-fruited Seedbox (Ludwigia microcarpa)	SRS
Florida Adder's Mouth (Malaxis spicata)	SRS
Spoonflower (Peltandra virginica ssp. luteospadix (=P. sagittaefolia))	SRS
White Beakrush (Rhynchospora alba)	PP
Cranberry (Vaccinium macrocarpon)	PP
Wildlife Species[2]	
Knobbed whelk (Busycon carica)	SC
Lightning whelk (Busycon Contrarium)	SC
Red-shouldered hawk (Buteo lineatus)	
Hessel's hairstreak (Callophrys hesseli)	SC
Parchment tube worm (Chaetopterus variopedatus)	SC
Piping plover (Charadrius melodus)	SC
Yellow rail (Coturnicops noveboracensis)	UNK
Lyre goby (Evorthodus lyricus)	SC
Merlin (Falco columbarius)	
Marsh killifish (Fundulus confluentus)	SC
Black-necked stilt (Himantopus mexicanus)	UNK
Outer Banks Kingsnake (Lampropeltis getulus sticticeps)	SC
Black rail (Laterallus jamaicensis)	UNK
Carolina Salt Marsh Snake (Nerodia sipedon williamengelsi)	UNK
Osprey (Pandion haliaetus)	SC
Brown pelican (Pelecanus occidentalis)	E
Black bear (Ursus americanus)	SC
Northern hairstreak (Strymon ontaria A)	UNK

(continued next page)

TABLE 3.4-1 (Continued)

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[1]From Sutter, R.D., L. Mansberg, and J. H. Moore. 1983. Endangered, threatened, and rare plant species of North Carolina: a revised list. ASB Bulletin 30: 153-163, and updated lists of the Natural Heritage and Plant Conservation Programs.

E = Endangered

T = Threatened

SC = Special Concern

PP = Primary Proposed

SRS = Significantly Rare

E,T, and SC species are protected by state law (the Plant Protection and Conservation Act, 1979); the other two categories indicate rarity and the need for population monitoring, as determined by the Plant Conservation and Natural Heritage Programs.

[2]Taken from Cooper, J.E., S.S. Robinson, and J.B. Funderburg (Eds.). 1977. Endangered and Threatened Plants and Animals of North Carolina. N.C. Museum of Natural History, Raleigh, NC. 444 pages + i- xvi.

E = Endangered
T = Threatened
SC = Special Concern
UNK = Unknown

The Swanquarter National Wildlife Refuge was established in 1932. The refuge is composed of about 15,500 acres of islands and coastal marshlands interspersed with creeks, potholes, and tidal drains. An additional 27,000 acres of open water are closed by Presidential Proclamation to the taking of migratory birds. Approximately 8,800 acres of the refuge are included in the National Wilderness Preservation System.

The Mattamuskeet National Wildlife Refuge was established in 1934 and is located in Hyde County. The refuge contains approximately 40,000 acres of water, 7,000 acres of marsh, 3,000 acres of timber, and 400 acres of cropland. The refuge includes the 80 acre Salyer's Ridge Research Natural Area and about 590 acres proposed for inclusion in the National Wilderness Preservation System.

The Alligator River National Wildlife Refuge was established in 1985 through a donation of 118,000 acres by Prudential Life Insurance Co., Inc. The refuge is located primarily on mainland Dare County with about 6,000 acres being located in Tyrrell County on the west side of the Alligator River.

The Cape Hatteras National Seashore is located along the coast of North Carolina. It composes part of the off-shore fringe islands that generally parallel the mainland shores of North Carolina. Cape Hatteras, composed of approximately 24,400 acres, was established in 1953. Most of the property was originally owned by the State of North Carolina and subsequently donated to the Federal government. This seashore is visited by approximately 2,000,000 tourists each year. The area provides critical habitat for many plant and animal species including the plants Carolina Lilaropsis and Amaranthus pumilus, Loggerhead Turtles, Peregrine Falcons and Bald Eagles.

The Cape Lookout National Seashore is located along the North Carolina coast close to Cherry Point, North Carolina, and within close proximity to Cedar Island National Wildlife Refuge. Cape Lookout occupies approximately 28,000 acres and was established in 1976. The large sand dunes located on a portion of the Cape provide an unusual topographical feature. Approximately 100,000 tourists visit the area each year. Some plant and animal species which are present in this area and that are of special concern, rare, or endangered include the plant Amaranthus pumilus, the Loggerhead Turtle, the Piping Plover, and the Least Tern.

Cedar Island National Wildlife Refuge is located on the coast of North Carolina just east of Cherry Point. This refuge is comprised of approximately 12,526 acres. The refuge was first established in 1964. This refuge typically does not receive a large number of tourists; however, it does provide important wildlife habitat. The refuge is a nesting area for approximately 40,000 Red Head Ducks. Terns and pelicans also nest on or near the refuge. The refuge is occasionally visited by the Bald Eagle, Piping Plover, Black Duck, and Black Rail.

The Pee Dee National Wildlife Refuge is located near Waldesboro, North Carolina, adjacent to the Great Pee Dee River. This refuge, comprised of approximately

8,400 acres, was first established in 1965. This area was originally privately owned before being purchased by the State of North Carolina. It was eventually donated to the Federal Government to serve as a protected refuge for wildlife and plant species. This refuge is visited each year by approximately 40 to 50,000 tourists. The Red-cockaded Woodpecker nests in the area and up to eight Bald Eagles have been seen in the area during the winter months.

The Carolina Sandhills National Wildlife Refuge is located entirely in Chesterfield County, South Carolina. The refuge includes approximately 46,000 acres. The area includes a large network of sand dunes that provides an excellent habitat for the Long Leaf Pine. This refuge is probably the home for more Red-cockaded Woodpeckers than any other wildlife refuge. The Eastern Cougar is believed to reside in the area. Bald Eagles and Peregrine Falcons have been observed in the area but do not nest there. The refuge is located in an area that is not very populated and visitation is low.

Each of these refuges provides an excellent habitat for a natural diversity of wildlife species. Many of the refuges provide a wintering habitat for migratory waterfowl and all provide habitat for the protection of threatened and endangered species. Thousands of Snow and Canada geese, Whistling Swans, coots, and many species of duck may be found during the winter at the refuges. In addition to waterfowl, large numbers of hawks, owls, gulls, terns, and other birds may be seen at the refuges. Animals commonly found at the refuges include Whitetail Deer, Black Bear, raccoon, squirrels, bobcat, fox, muskrat, mink and rabbit.

Croatan National Forest, in addition to the above areas, is located near Range BT-11 (Figure 3.0-3). This national forest occupies approximately 306,000 acres. The area includes Great Lake which has a shoreline that is considered to be one of the better areas for birds in North Carolina. Nesting birds in the forest include ospreys, herons, comorants and warblers.

3.4.5. Agricultural Resources

Wayne County is in the center of an agriculturally rich area. In 1983, Wayne County was eighth in the State in farm cash receipts regarding all crops and ranked fourth regarding livestock, dairy, and poultry. Major agricultural crops are tobacco, corn, soybeans, and wheat.

Farm animals, particularly egg-laying poultry, have been cited as sensitive to low-level aircraft noise. According to the North Carolina Agricultural Statistics (NCDA, 1985), there are 900,000 chickens on Wayne County farms.

Both Johnston and Sampson Counties, which are located under the Echo MOA airspace, are rich agricultural areas. In 1983, they were ranked second and third in the State, respectively, in cash receipts for farm crops. Sampson County was ranked sixth for livestock, dairy, and poultry. As for Wayne County, the major crops are tobacco, corn, soybeans, and wheat.

Agricultural resources in Dare County, in general, are sparse. The 1985 North

Carolina Agricultural Statistics Report (NCDA, 1985) indicates that Dare County farms contain less than 500 head of cattle, 500 head of hogs and 5,000 chickens. Statistics also indicate that only 1,400 acres of harvested cropland exist in the county. The main harvested crops are wheat and corn for grain, and soybeans.

Modern agricultural development has not been attempted on the DCR. The Alligator River swamp forest which is located on the western end of the DCR and the low pocosin located on the eastern portion of the DCR consist of predominantly deep peat soils of the Pungo series which are considered inferior for agricultural use due to excessive wood content. The cane pocosin located primarily in the center of the DCR consists of the Ponzer soils which are a prime agricultural soil type.

3.4.6. Special Use Areas

As discussed in Section 3.3.6, areas that attract visitors and that are used for recreation by local residents are Neuse State Park, Bentonville Battlefield, and Laurel Lake Gardens. Neuse State Park, approximately 8 miles southeast of Seymour Johnson AFB, provides unique geological features. Bentonville Battlefield, a site of historical interest, and Laurel Lake Gardens, which provides an extensive display of ornamental plant and flower gardens, are both located under the Echo MOA airspace. Riverside Campground is a privately owned campground located in Hyde County close to the township of Leechville, North Carolina. This campground is beneath the airspace of MTRs approaching DCR. Because of the number of MTRs proposed for use by the F-15E LANTIRN mission and their location over sparsely populated areas, portions of several wildlife management and recreational areas such as State parks and National forests are near or beneath MTR airspace (see Figure 3.0-1).

3.5. Aircraft Accident Potential

3.5.1. Current Operations

Three squadrons of F-4Es and 20 KC-10 tankers constitute the primary flying operations at Seymour Johnson AFB. The KC-10 flying operations will not be affected by the proposed action, but all three F-4E squadrons will be replaced. The F-4Es are currently flying a mixture of air-to-air and surface attack sorties. To simulate the level of effort required during an armed conflict, the three squadrons periodically engage in "surge" operations (Carlin, personal communication, 1985). During the surge period, each squadron flies approximately 63 sorties per day for a total of 189 sorties over a 15-16 hour period every day. Current operations also involve periodic night flights (with landings before 10:00 P.M.). A total of 1,200 night sorties per year are required for the F-4Es, or approximately seven percent of all F-4E sorties from Seymour Johnson AFB.

The three squadrons of F-4Es at Seymour Johnson AFB use the DCR to maintain weapons delivery qualifications for both day and night mission requirements. Night surface attack sorties are flown on both the nuclear and conventional delivery targets and are limited to a maximum of 2 F-4Es at any time on the range (USAF, 1985c).

3.5.2. Accident History

Because the proposed action will result in the replacement of all F-4Es by F-15Es, it is appropriate to review the accident history of both aircraft. The F-15 is a newer fighter capable of higher performance than the F-4 it was built to replace. To date, the F-15 loss rate to accidents is one-half the rate the F-4 has experienced at the same point in its career (Rhodes, 1985). The following table (Table 3.5-1) summarizes a twelve year accident history (1975 through 1986) on both aircraft obtained from the Air Force Inspection and Safety Center (AFISC) database at Norton AFB, California (Atkins, personal communication, 21 April 1987). The table shows statistics for both Class A and Class B mishaps. Class A mishaps are those involving loss of life or damage in excess of $500,000. Class B mishaps involve no loss of life and have damages costing between $100,000 and $500,000. The statistics are for all F-4s and F-15s in the TAC.

On the basis of mishaps per 100,000 flying hours, the F-15 safety record is superior to the F-4 with respect to the more serious Class A mishaps. The F-15 has experienced only 61 percent as many total Class A accidents per 100,000 flying hours as the F-4 during the twelve year period. With respect to accident potential in the local area around a base, the F-15 Class A mishap rate for takeoff and landing phase accidents has been only 66 percent of that rate experienced by the F-4s. However, the F-4 has a better record with respect to the less serious Class B mishaps. The F-4 Class B mishap rate is only 28 percent that of the F-15 over this twelve year period.

TABLE 3.5-1

ACCIDENT HISTORY COMPARISON
(1975-1986)

	Total	Day	Night	On Range	Takeoff	Landing
Class A						
F-4	87	82	5	23	12	4
F-15	25	21	4	0	4	1
Class B						
F-4	37	33	4	5	4	9
F-15	63	58	5	2	6	8
Total Flying Hours:						
F-4	1,913,380					
F-15	900,303					

Almost 26 percent of F-4 Class A mishaps throughout TAC during the twelve year period 1975 through 1986 occurred on gunnery ranges. However, Seymour Johnson-based F-4s have not experienced either a Class A or Class B accident on the range since before 1980 (Carlin, personal communication, 1986).

3.5.3. Human Health Considerations

The threat to human health from aircraft accidents at Seymour Johnson AFB has been addressed many times in the past. These assessments are summarized in the AICUZ Report for Seymour Johnson AFB, dated July 1983 (USAF, 1983a). The purposes of this AICUZ Report were to evaluate the effects of aircraft noise and accident potential, and to develop and establish a means to ensure the health, safety, and welfare of the citizens of the surrounding communities while protecting the operational capabilities of Seymour Johnson AFB.

The AICUZ report references findings from Air Force studies involving hundreds of aircraft accidents. As a result of those findings, three accident potential zones are established for the Seymour Johnson AFB runway which define acceptable land use guidelines intended to protect human health. The Air Force studies indicate that the location with the highest potential for aircraft accidents, within 10 miles of a base, is along the extended centerline of a runway. The potential decreases with distance from the end of the runway. Therefore, a Clear Zone, an Accident Potential Zone (APZ) I, and an APZ II have been defined for the extended centerline, in both directions, of the Seymour Johnson AFB runway.

The Clear Zones are 3,000 feet wide and extend out from the ends of the runway for 3000 feet. Accident statistics indicate this to be the highest risk area for aircraft accidents and, therefore, land use restrictions prohibit any reasonable economic use of the land. It will be kept clear of any structures, buildings, etc. which could possibly be populated. APZ I is also 3000 feet wide and extends out from the Clear Zone another 5000 feet along the runway centerline. Similarly, APZ II extends from the end of APZ I for another 7000 feet and is also 3000 feet wide.

Risks within APZ I are lower than those of the Clear Zone and allow some limited economic development of those areas which ensure limited exposure of the populace to the risks. Some risk is still associated with APZ II, but fewer land use restrictions apply within this area. However, to limit the human health risks, multi-story buildings, theaters, churches, schools, hospitals, and other high-density functions are not considered appropriate for either APZ I or APZ II.

Seymour Johnson AFB now owns or has acquired easements to allow it to control land use in the Clear Zones. The APZ I and APZ II land use recommendations of the AICUZ Report provide further land use guidelines to protect the health of the local populace from the aircraft accident potential.

Public access to the DCR is restricted. The only personnel exposed to health hazards from gunnery operations and aircraft accidents are the range personnel required to operate the facility and the aircrew themselves. Safety is one of the main functions of the range operations personnel. Flight operations at manned gunnery ranges are closely controlled and follow established procedures to maximize the safety of personnel while accomplishing the training mission. Precise flight paths, minimum altitudes, and in-flight emergency procedures for the range have been established and are included in the preflight briefing prior to every surface attack sortie to the range.

3.6 Laser Operations

Lasers are devices which produce electromagnetic radiation using Light Amplification by Simulated Emission of Radiation (LASER). In general, lasers can produce radiation in the wavelength region between ten and one million nanometers, and operate in either the continuous wave or pulsed mode. The pulsed mode includes normal, Q-switched, and mode-locked operation. Pulsed lasers can be operated to produce repetitive pulses (the pulse repetition frequency is the number of pulses which the laser produces per unit time).

Air Force use of lasers is controlled by Air Force Occupational Health and Safety Standard 161-10, Health Hazards for Laser Radiation, and Air Force Regulation (AFR) 50-46, Weapons Ranges, which addresses use of lasers on ranges. To protect range personnel and the environment, ranges are required to be certified for each laser system that could be employed on the range. The DCR has been certified for two more powerful lasers, Pave Spike and Pave Tack, than the LANTIRN laser.

The purpose of the Pave Spike and Pave Tack operations on the DCR is to train aircrews and maintenance personnel in the use of laser-assisted target designation. This procedure significantly increases the ability of the Air Force, including Air Force Reserves (AFRES) and Air National Guard (ANG) aircraft, to deliver ordnance on hostile targets. Laser designation equipment is increasingly coming in to the Air Force, and aircrews need this training to fully master this technique.

The system consists of a pod-mounted, self-contained laser mounted on the underside of the aircraft. This system shines a small laser light beam on the ground. The beam diverges only slightly; it covers an area of up to several feet in diameter on the ground. The laser may be directed at one spot at a time, although the aircrew can move the spot by re-aiming.

Lasers are mounted on F-4 aircraft of the 4 TFW, AFRES, and ANG as well as other visiting aircraft that use the DCR.

Laser hazard footprints for Pave Tack and Pave Spike lasers have been determined for the DCR. These footprints take into account laser strength and divergence and, at high angles of incidence to the ground, the ability of reflected ground waves to reinforce the primary beam (shiney "specular" targets can reflect a beam). The width of the beam footprints can be quite narrow, 75 feet wide at most. At low angles of incidence, the length of the footprint could be quite long, extending as far as seven miles past the target and almost four miles from the target toward the lasing aircraft in the worst case. The altitude and slant ranges that produce these lengthy footprints (100 feet and 2.5 to 5 miles) would be maintained for only a few seconds. More common attack altitudes produce footprints that average 2,000 feet in length; orbiting aircraft at higher altitudes, which continue to lase the target while other aircraft attack it, produce footprints only a couple of hundred feet in length.

Targets are located such that the footprints are contained on the range. Specular reflections from targets are not considered to be a problem for either aircrews or range personnel because AFR 50-46 requires removal or painting of reflective surfaces such as mirrors, chrome, and windows. The DCR contains standing bodies of water which are considered reflective surfaces when still. The probability of an inadvertent self-exposure is low and limited to those times where one is at a high bank angle (knife edge pattern) over the water. Reflections will be at the same angle as the incident laser beam. The water reflects only two percent of the energy from a perpendicular beam (1060 nm) and the canopy further reduces the beam's strength. Safety equipment (such as goggles) and procedures (such as controlling target location in respect to the range tower and attack headings) minimize range personnel's potential exposure to reflected laser energy.

Both Pave Spike and Pave Tack laser systems have been employed on the DCR without undue risk for the aircrews and range personnel.

3.7. Socioeconomics

3.7.1. Current Setting of Seymour Johnson AFB and Dare County Range

3.7.1.1. General Description

Seymour Johnson AFB is a major employer and purchaser of goods and services in the Goldsboro metropolitan area, which is part of Wayne County in the State of North Carolina. Goldsboro is situated in the center of Wayne County and serves as the County seat. The county had an estimated 1984 population of 98,479, of which 31,871 reside within the Goldsboro city limits. Seymour Johnson AFB has its most immediate impact on communities located near the base. These communities include Brogden, New Hope, South Goldsboro, Mar-Mac, Elroy, Genoa, and Walnut Creek.

3.7.1.2. Demographics

Wayne County population has been growing moderately but steadily over the past decade and a half. The latest data available shown in Table 3.7-1 indicated that between 1970-1980, the Wayne County population increased by an average 1.3% per year. This compares to an average growth rate of 1.5% per year for the State of North Carolina as a whole. In 1980, Wayne County represented approximately 2.3% of the population for the State, which was 5,880,965. Estimates released by the State of North Carolina Office of Management and Budget indicate that the county's population increased by an additional 1,425 people between April 1980 and July 1984, or an increase of 1.5% to 98,479.

Wayne County is divided into 12 townships. These are Brogden, Buck Swamp, Fork, Goldsboro, Grantham, Great Swamp, Indian Springs, Nahunta, New Hope, Pikeville, Saulston, and Stoney Creek. In addition, Wayne County has eight major municipalities including Eureka, Fremont, Goldsboro, Mt. Olive, Pikeville, Seven Springs, South Goldsboro, and Walnut Creek, and several unincorporated towns such as Mar-Mac, Genoa, Elroy, and New Hope. Table 3.7-1 identifies the 1980 population estimates for each municipality and township and their corresponding average annual growth rates.

The major population growth has occurred in the townships of Brogden, Indian Springs, New Hope, Pikeville, Saulston, Stoney Creek, and the municipalities of Pikeville and Goldsboro. Several townships lost population during this period, including Goldsboro, Great Swamp, and Nahunta. The municipality of Seven Springs also lost population.

Table 3.7-2 provides a breakdown of the distribution of population by township as a percent of total county population. This table indicates that the three major townships in terms of population are Brogden, Goldsboro, and New Hope. Together, these townships accounted for 47% of the population in Wayne County.

The major reason for the increase in population in the municipality of Goldsboro during the 1970-1980 was the annexation of Seymour Johnson AFB in February 1977. This annexation brought approximately 7,000 people within the city limits

TABLE 3.7-1

POPULATION ESTIMATES FOR WAYNE COUNTY,
SELECTED COMMUNITIES WITHIN WAYNE COUNTY,
NORTH CAROLINA, AND THE UNITED STATES

Area	1970	1980	Average Annual Percent Change 1970-1980
Wayne County	120,330	137,011	1.3%
Eureka*	263	303	1.4%
Fremont*	1,596	1,736	0.8%
Goldsboro*	25,629	31,871	2.2%
Mt. Olive*	4,872	4,876	0.0%
Pikeville*	320	662	7.5%
Seven Springs	188	166	-1.1%
South Goldsboro*	2,054	N/A	N/A
Walnut Creek	N/A	343	N/A
Brogden	13,442	18,005	3.0%
Buck Swamp	2,034	2,108	0.4%
Fork	6,578	6,795	1.3%
Goldsboro	29,822	26,778	-1.0%
Grantham	2,872	3,086	-0.7%
Great Swamp	1,286	1,239	-0.4%
Indian Springs	2,242	3,552	4.7%
Nahunta	3,944	3,844	-0.2%
New Hope	14,994	19,293	2.6%
Pikeville	1,170	1,771	4.2%
Saulston	1,858	2,659	3.6%
Stoney Creek	5,166	7,924	4.4%
North Carolina	5,084,411	5,880,965	1.5%
United States	205,052,000	227,738,000	1.1%

*Municipalities; Remainder are townships

SOURCE: U.S. Bureau of Census, 1980 Census of Population and Housing

TABLE 3.7-2

DISTRIBUTION OF WAYNE COUNTY POPULATION
BY TOWNSHIP AREAS

Township	Percent of County Population 1970	1980	Change
Brogden	11.2%	13.1%	+1.9%
Buck Swamp	1.7%	1.5%	-0.2%
Fork	5.5%	5.0%	-0.5%
Goldsboro	24.8%	19.5%	-5.3%
Grantham	2.4%	2.3%	-0.1%
Great Swamp	1.1%	0.9%	-0.2%
Indian Springs	1.9%	2.6%	+0.7%
Nahunta	3.3%	2.8%	-0.5%
New Hope	12.5%	14.1%	+1.6%
Pikeville	1.0%	1.3%	+0.3%
Saulston	1.5%	1.9%	+0.4%
Stoney Creek	4.3%	5.8%	+1.5%

SOURCE: Wayne County Planning Department, and U.S. Bureau of Census, 1970-1980 Census of Population and Housing

offsetting much of the out-migration from the municipality to the surrounding townships.

Characteristics of the population for areas affected by the current AICUZ are shown on Table 3.7-3. The primary source for these data is the 1980 Census of Population and Housing produced by the U.S. Bureau of the Census for Wayne County. The population characteristics for each area are estimated by assigning census tracts to each district. Because geographic tract definitions do not precisely coincide with incorporated township areas, the demographic characteristics are approximations only.

3.7.1.3. Land Use and Housing Characteristics

Seymour Johnson AFB is bordered by two zoning authorities. The northern boundary of the base is contiguous with the City of Goldsboro and the rest of the base is bordered by Wayne County. Most of the land within the Seymour Johnson AFB AICUZ falls under the jurisdiction of Wayne County. Only a small area of the City falls in the AICUZ, limited primarily to areas of South Goldsboro. In general, a very small portion of the land within the baseline Seymour Johnson AFB AICUZ is subject to zoning control by local government authorities.

The Zoning Ordinance of Wayne County specified that an Airport District be established adjacent to one end of the runway. The purpose of the district is to reduce the possibility of injury due to noise or aircraft crashes in areas adjacent to the base. Land uses are limited to those consistent with low population concentrations. The Airport District applies only to an area approximately 2,500 acres in size off the west end of the runway, leaving the majority of the land around the base without zoning restrictions.

The City of Goldsboro has extended its extra-territorial jurisdiction up to one mile beyond the city limits. The annexation of the base by the city in 1977 allows it to invoke the one mile jurisdiction outside the base boundary. The city has zoned the one mile extension around the base and has finished mapping the area. The extension does not include all areas included in the Accident Potential Zone. Land use in Wayne County, with the exception of Goldsboro and the Airport District mentioned above, is without zoning regulation. Excluding military housing at Seymour Johnson AFB, there are approximately 35,032 housing units within Wayne County. Characteristics of the dwelling units within many of the communities are shown in Table 3.7-4. The majority of the housing units within the area are distributed in the communities as follows: Goldsboro, 32.8%; Brogden, 7.6%; New Hope, 6.8%; Indian Springs, 8.9%; South Goldsboro, 2.9%. The remaining housing units are distributed throughout the county, primarily in rural settings.

Conventional single family detached homes account for almost 75% of the total housing inventory in Wayne County. Mobile homes represent 13% of the total, while multiple family units account for 12.9%. A large share of the multiple family units are located in the Goldsboro area, and the area near Seymour

TABLE 3.7-3

POPULATION CHARACTERISTICS

Characteristics	City of Goldsboro	Brogden	Indian Springs	New Hope*	Wayne County	
Median Age (years)		26.8	28.2	25.6	26.7	27.7
Ethnic Composition (%)						
White	53.9%	83.0%	67.1%	83.1%	66.4%	
Black	44.5%	15.9%	32.3%	15.7%	32.6%	
Other	1.7%	1.1%	0.6%	1.3%	1.0%	
Spanish Orgin		1.4%	0.6%	0.7%	1.2%	1.0%
Occupation (%)						
Managerial, Professional	21.4%	16.8%	12.9%	20.3%	17.5%	
Technical, Sales, Administration		26.9%	29.2%	18.1%	22.2%	24.8%
Service	18.2%	9.6%	14.3%	11.9%	14.0%	
Farming, Forrestry, Fishing	1.7%	4.1%	7.0%	7.9%	5.6%	
Craft, repair		9.3%	20.3%	14.5%	14.1%	13.6%
Operators, Laborers		22.5%	20.0%	33.1%	23.6%	24.5%
Manufacturing		23.3%	29.7%	32.5%	23.5%	26.0%
Trade	19.8%	19.3%	18.4%	21.3%	19.9%	
Median Household Income		$11,161	$16,691	$13,127	$16,087	$12,931

* Estimates for Township areas.

SOURCE: Estimated from 1980 Census of Population and Housing, North Carolina

TABLE 3.7-4

HOUSING CHARACTERISTICS
SELECTED AREAS, WAYNE COUNTY

Characteristics	City of Goldsboro[1]	South Goldsboro[2]	Brogden[3]	Indian Springs[3]	New Hope[3]	Wayne County
Housing Units	11,900	1,004	2,678	3,078	2,384	35,032
Single-Family (%)	72.0%	73.2%	75.9%	70.0%	68.7%	74.1%
Multi-Family (%)	16.5%	26.8%	3.9%	2.05	1.5%	12.9%
Mobile Homes (%)	1.5%	0.0%	20.2%	28.0%	29.8%	13.0%
% Owner Occupied	39.6%	28.2%	76.1%	73.4%	72.8%	59.2%
Rooms (Median)	5.1	4.5	5.3	5.1	5.2	5.1
Persons Per Unit (Median)	2.4	2.9	2.8	2.9	2.7	2.6
% Central Air	42.8%	18.5%	47.5%	34.2%	50.2%	40.3%
% Warm Furnace	51.2%	30.4%	53.8%	52.6%	58.2%	50.4%
% Built 1970 or later	17.6%	25.2%	43.3%	56.8%	57.3%	34.0%
% Complete Kitchen	98.2%	97.9%	97.0%	96.6%	96.2%	95.7%
% 1.5 Baths or More	30.1%	31.3%	44.9%	35.0%	50.4%	37.2%
% Substandard Plumbing	1.8%	0.3%	4.1%	6.8%	3.0%	5.0%
Median House Value ($000)	$ 33.4	$ 30.9	$ 38.1	$ 31.7	$ 44.3	$ 35.8
Median Rent	$ 130	$ 113	$ 126	$ 123	$ 133	$ 122

[1,2] Municipal areas

[3] Township areas

SOURCE: 1980 Census of Housing and Population, North Carolina

Johnson AFB. Mobile homes are concentrated near the townships of New Hope, Brogden, and Indian Springs.

Approximately 59% of the homes within Wayne County are owner-occupied. As shown on Table 3.7-4, most of the communities near Seymour Johnson AFB have a higher percentage of homes owner-occupied, averaging above 70% in the major townships of Brogden, Indian Springs, and New Hope. Significantly, the Goldsboro and South Goldsboro areas averages much lower percent owner-occupied, reflecting the higher proportion of multi-family residences within these areas.

Most of the housing within the study area averages five rooms, with the exception of Walnut Creek, where homes have between 8-9 rooms. In general, the data indicate that most of the housing stock have complete kitchens and plumbing facilities, and are inhabited by 2-3 people on average. Further, most of the housing values in the communities near the base approximate the county average of $36,000 with the exception of Walnut Creek, where housing values occur in excess of $100,000.

One significant feature of the Wayne County housing stock is readily apparent from the data in Table 3.7-4. The proportion of the housing built in 1970 or later is substantially lower for Goldsboro than for the other communities and for Wayne County in general. Clearly, a major portion of the housing construction taking place within Wayne County has occurred outside of the Goldsboro City limits.

Airfield environs planning is concerned with three primary aircraft operational/land use determinants: (1) accident potential to land users, (2) aircraft noise, and (3) hazards to operations from land uses (height, obstructions, etc.).

At both ends of Seymour Johnson AFB runway, a Clear Zone and two APZs have been designated. The Air Force identified a corridor which contained the maximum percentage of accidents within the smallest area. This "crash hazard area" extends 15,000 feet from the threshold at both ends of a runway. It was further divided into an expanded clear zone and two APZs.

The Clear Zone is 3,000 feet wide and extends 3,000 feet from the runway threshold along the runway centerline. APZ I is 3,000 feet wide and extends 5,000 feet from the end of the Clear Zone. APZ II is also 3,000 feet wide and extends 7,000 feet from the end of APZ I.

Within the Clear Zone the risk is so high as to prohibit reasonable economic use of the land. It is Air Force policy to request from the U.S. Congress the authorization and appropriations needed to acquire the necessary real property interests in these zones.
APZ I is less critical than the Clear Zone, but possesses a significant risk factor. The level of risk in APZ II is lower than that in APZ I, but still significant. The potential for accidents outside of the Clear Zone, APZ I and APZ II is not significant enough to warrant special attention.

The main objective of APZ is to restrict any and all population intensive uses because of the risk in these areas. The basic criteria for APZ I and APZ II land use guidelines is the prevention of uses which:

1. Have high residential density characteristics.

2. Have high labor intensity.

3. Involve explosive, fire, toxic, corrosive, or other hazardous characteristics.

4. Promote population concentration, especially for extended durations.

5. Involve utilities and services required for area-wide population where disruption would have an adverse impact (telephone, gas, etc.).

6. Concentrate people who may have difficulty responding to emergency situations (e.g. children, elderly, handicapped).

7. Pose hazards to aircraft operations.

APZ I is less critical than the Clear Zone, but still possesses a significant risk factor. APZ I has compatibility with a number of industrial/manufacturing, transportation, utility, wholesale trade, open space, recreational, and agricultural uses. Structures should be located toward the edges of APZ I whenever possible.

APZ II is less critical than APZ I, but still possesses some risk. High-density functions, such as multi-story buildings, places of assembly (theaters, churches, schools, restaurants, hospitals, etc.) and high-density office uses are not considered appropriate in either APZ I or II.

Acceptable uses in APZ II include those of APZ I (where not in conflict with noise criteria), as well as low-density single-family residential, and those personal and business services and commercial/retail trade uses of low intensity or scale of operation.

People intensive uses are limited. The optimum density recommended for residential usage in APZ II (where it does not conflict with noise criteria) is one dwelling per acre. For most non-residential uses, buildings should be limited to one story and the lot coverage should not exceed 20 percent.

The following federal agencies have policies or programs concerning noise and land use compatibility:

- Department of Defense (DOD)
- Department of Housing and Urban Development (HUD)
- Environmental Protection Agency (EPA)
- Department of Transportation/Federal Aviation Administration (DOT/FAA)
- Veterans Administration (VA)

DOD policy for noise compatible land use guidance is AICUZ. Each military service has an AICUZ program to investigate, describe, and study noise exposure and land use at all DOD air installations. AICUZ studies for each installation are prepared and given to the public and local, regional, state, and other Federal agencies for use in their land use planning/control and intergovernmental programs and processes. Each study contains noise contours, APZs, existing and future land use compatibilities, and land use planning/control recommendations.

There are 13 Compatible Use Districts (CUDs), some or all are represented in AICUZ reports:

CUD 1	DNL 85+
CUD 2	APZ I and DNL 80-85
CUD 3	APZ I and DNL 75-80
CUD 4	APZ I and DNL 70-75
CUD 5	APZ I and DNL 65-70
CUD 6	DNL 80-85
CUD 7	DNL 75-80
CUD 8	APZ II and DNL 80-85
CUD 9	APZ II and DNL 75-80
CUD 10	APZ II and DNL 70-75
CUD 11	APZ II and DNL 65-70
CUD 12	DNL 70-75
CUD 13	DNL 65-70

At the core of the AICUZ program is a matrix of compatible land uses developed for the individual installation. This matrix outlines recommendations for each district which provide the most compatible land uses. This will assure that people are not concentrated in areas which are exposed to high noise and/or aircraft accident potential. Definition of recommended land uses according to AICUZ districts is provided in Table 3.7-5.

The major purpose of the HUD's noise regulations (24 CFR Part 51 Sub-part B) is to insure that activities assisted or insured by HUD achieve the goal of a suitable living environment.

HUD also supports other agencies' efforts in noise control. The regulations generally apply to all HUD actions and provide minimum national standards to protect citizens against excessive noise in their communities and places of residence. The basis policy is that HUD assistance for construction of new noise sensitive uses is prohibited generally for projects with Normally Unacceptable noise exposure. Unacceptable noise exposure is defined as a noise level above 75 dB. These noise levels are to be based on noise from all sources: highway, railroad, aircraft, industry, mining, etc.

Attenuation measures are normally required before projects in the Normally Unacceptable zone can be approved. Attenuation measures that reduce the external noise at a site are preferred, over measures which only provide

TABLE 3.7-5

LAND USE RECOMMENDATIONS
SEYMOUR JOHNSON AFB AICUZ

Land Use Districts	Compatible Use Districts												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Residential	ND	ND	ND	ND	ND	ND	ND	ND	ND	RD	RD	RD	RD
Schools, Churches	ND	ND	ND	ND	ND	ND	ND	ND	ND	RD	RD	RD	RD
Services	ND	ND	ND	ND	ND	ND	RD	ND	RD	RD	RD	RD	NR
Commercial	ND	ND	ND	ND	ND	ND	RD	ND	RD	RD	RD	NR	NR
Recreation	ND	ND	RD	ND	ND	RD	RD	ND	RD	RD	RD	NR	NR
Manufacturing	ND	RD	RD	RD	RD	RD	RD	RD	RD	RD	RD	NR	NR
Transportation	RD	NR	NR	RD	RD	NR	NR	NR	NR	NR	NR	NR	NR
Agriculture	RD	NR	NR	RD	NR	NR	NR	NR	NR	NR	NR	NR	NR

ND: No New Development

RD: Restricted New Development

NR: No Development Restrictions

SOURCE: AICUZ Statement, Seymour Johnson Air Force Base

attenuation for interior spaces. HUD's noise regulations also apply to modernization and rehabilitation. For major or substantial rehabilitation projects in the Normally Unacceptable and Unacceptable Noise Zones, HUD actively will seek to have noise attenuation features incorporated into the project. In the Unacceptable Noise zones, HUD will strongly encourage conversion of noise exposed sites to more compatible land uses.

HUD also requires that Comprehensive Planning Assistance grantees give adequate consideration to noise as an integral part of the urban environment, with particular emphasis being placed on the importance of compatible land use planning in relation to airports, highways, and other sources of high noise. Recipients of community development block grants under Title I of the Housing and Community Development Act of 1974 must also take into consideration the noise criteria and standards in the environmental assessment process. A summary of HUD restrictions is provided by Table 3.7-6.

The EPA's noise program is designed to provide leadership to the national noise abatement effort. The key statutory mandates under which EPA operates are the Noise Control Act of 1972 (PL 92-574) and the Quiet Communities Act of 1978 (PL 95-609). Until recently, EPA's program has concentrated its efforts in setting noise source emission standards for various products, including transportation vehicles, construction equipment, and consumer products. EPA also proposes aircraft/airport regulations to the FAA following a special procedure specified in the Noise Control Act of 1972 (since military aircraft are not certified by FAA, provisions of the Noise Control Act of 1972 does not apply).

Key to these efforts have been EPA reports defining scientifically the relationships between noise levels and human response. The EPA "Levels" document established threshold levels of impact which, if met, would protect the public "with an adequate margin of safety." While these levels have relevance for planning, they, in themselves, are not necessarily appropriate land use planning criteria because they do not consider cost, feasibility, or the development needs of the community.

The FAA's noise program is guided by the 1976 Aviation Noise Abatement Act of 1979. The policy defines the responsibility of the FAA, airport proprietors and users, and land use planning and control authorities in achieving and maintaining airport noise compatibility. The FAA uses two major approaches to implement this policy. The first is aimed at reducing the noise of the individual aircraft. This includes a program to retrofit engines or equipment on noisy aircraft or to replace them with newer, quieter aircraft. It also includes the development of operations procedures which can reduce the aircraft's noise impacts.

The other major approach to noise compatibility is through planning and development activities at airports under the Airport and Airway Development Act of 1970 (as amended). Airport Noise Control and Land Use Compatibility (ANCLUC) planning studies integrate the master planning study activities, the environmental considerations, and the airport-land use compatibility planning activities at an airport. The objective is to achieve maximum noise and

TABLE 3.7-6

HOUSING AND URBAN DEVELOPMENT ASSISTANCE RESTRICTIONS

	Day-Night Average Sound Level (in decibels)	Special Approvals and Requirements
Acceptable	Not exceeding 65 dB(1)	None
Normally Unacceptable	Above 65 dB but not exceeding 75 dB	Special Approvals(2) Environmental Review(3) Attenuation(4)
Unacceptable	Above 75 dB	Special Approvals(2) Environmental Review(5)

NOTES:
(1) Acceptable threshold may be shifted to 70 dB in special circumstances pursuan to Section 51.105(a) of the H.U.D. regulations.
(2) See Section 51.104(b) for requirements.
(3) See Section 51.104(b) for requirements.
(4) 5 dB additional attenuation required for sites above 65 dB but not exceeding 70 dB and 10 dB additional attenuation required for sites above 70 dB but not exceed 75 dB. (See Section 51.104(a).
(5) Attenuation measures to be submitted to the Assistant Secretary for CPD for approval on a case-by-case basis.

SOURCE: 24 CFR Park 51. (Federal Register, Volume 44, No. 135, July 12, 1979.)

environmental compatibility within the constraints of safety, service, and economic viability. The plan may contain operational controls, as well as physical improvements for the airport. It will also recommend, based upon a comprehensive study effort, uses and strategies for land use control for areas around the airport impacted by noise. FAA's Advisory Circular, Airport-Land Use Compatibility Planning (AC 150/5050-6), serves as the basic guidance for the land use compatibility portion of an ANCLUC study.

The Aviation Safety and Noise Abatement Act of 1979 strengthens the FAA's noise policy by providing assistance to airport operators to prepare and carry out noise compatibility programs and providing incentives for replacing noisy aircraft with new technology aircraft. In compliance with this act, the FAA has developed an amendment to Part 150 of the Federal Aviation Regulations (FAR) which standardizes airport noise metrics for use in airport noise assessments and identifies land uses compatible with yearly DNL. (The Air Forces' AICUZ program meets Part 150 of the FAR).

The VA's policy for consideration of noise and land use planning is contained in separate statements. One statement is for the VA's Loan Guaranty Program and the other is for both the Department of Medicine and Surgery and the Department of Memorial Affairs.

The VA Loan Guaranty noise policy governs VA decisions as to whether residential sites in airport environs are "acceptable" for loan guaranty programs to eligible veterans and active duty personnel.

The VA Guaranty noise policy features a set of three noise zones. In the case of new construction, all new developments located in the two higher zones generally are not eligible for VA assistance. There is flexibility in that if a local officer recommends acceptance, the VA Central office will consider the case in light of geographic factors and proposed attenuation features, as well as marketability. In the middle zone, it may, therefore, be possible to develop properties which will be acceptable for VA loans. In all cases (existing, as well as proposed properties) for sites located in the two higher zones, VA requires that a statement from each veteran purchaser be obtained indicating awareness that: the property being purchased is located in an area adjacent to an airport, and the aircraft noise factor may affect normal liveability, value, and salability of the property.

The current Seymour Johnson AFB AICUZ extends primarily into the Brogden and New Hope townships, but also includes small portions of the South Goldsboro area. Overall, however, land within the AICUZ is predominately undeveloped or agricultural but some incompatible land use does exist.

Noise contours extend into a small portion of South Goldsboro. This area, which is north of the base, has CUDs of 6, 7, 12, and 13. The 12 and 13 CUDs are conditionally compatible while the 6 and 7 CUDs are incompatible. This area is single and multi-family dwellings with some commercial development. There is a church and a low income housing project within this part of the City of

Goldsboro. The rest of the incompatible and conditionally compatible areas are outside of the city limits.

West of the Base the 65 DNL contour goes all the way to Beaver Dam. Development has occurred in CUDs 7, 8, 9, and 10. Most of these facilities are incompatible. Growtn along U.S. 13 and its intersection with U.S. 117 is conditionally compatible with the AICUZ. Two churches are in this area as well as the Neuse River Shopping Center. Much of the development along U.S. 117 is commercial and industrial but several residential areas cause it to be classified as conditionally compatible.

Southwest of the Base are several conditionally compatible areas. Most of the areas are in or near the Township of Brogden. Brogden has been a fast growing area and it has a wide mix of developments, mobile home parks, and agricultural land. Two large developments located in CUD 13 are of special note. Robin Lake Estates and Fox Fire Estates both have large concentrations of homes in them. Two churches are in the CUD 13 zone near Brogden. Some residential development has taken place on county roads 1928 and 1915 within CUD 13. This development is conditionally compatible.

On the East end of the Base, there are several areas of concern. The greatest problem is the section of U.S. 70 which runs through APZ I. This part of the county has developed a large number of commercial establishments. Several restaurants, shops, and service stations are located there. U.S. 70 transgresses CUDs 2, 6, 7, 8, 9, 12, and 13 in this area. The CUD 2 is a special problem because of the high risk potential involved. The development continues out Highway 111 toward New Hope. Most of this development is incompatible. These areas have a mixture of industrial, commercial, and residential. Subdivisions border the clear zone on both the North and South sides. These subdivisions fall in CUDs 6, 7, 12, and 13. CUD 13 stretches all the way into Greene and Lenoir counties. The towns of Newsome, Parktown, and Jason are encompassed in CUD 13. These towns are rural and the homes are conditionally compatible.

Northeast of the base are two residential developments, a trailer park, a commercial area, and two churches. They all fall in CUD 12 and 13 and they are conditionally compatible.

Three areas around the base are not compatible with AICUZ. These areas are north of the Base around Slocum Street, west of the runway in CUD 8, and east of the runway in CUDs 2 and 8. Facilities that are conditionally compatible need sound attenuation to provide a safe and pleasant area.

The information in Table 3.7-7 provides an overview of the single-family dwellings within the CUD areas where the structures are located.

3.7.1.4. Structure of the Economy

The Wayne County economy has traditionally been agricultural. However, during the 1960's and 1970's, and continuing into the 1980's, the economy has become more diversified. Goldsboro, incorporated in 1847, developed as a tobacco

TABLE 3.7-7

STRUCTURE CHARACTERISTICS
RESIDENTIAL DWELLINGS
BASELINE AICUZ DISTRICTS

AICUZ CUD	No. Units	Percent Owner-Occupied	Average Persons Per Unit	Average No. Rooms	Percent Built 1970 Later	Average Home Value
6	564	64.8%	3.1	4.8	52.5%	$48,800
7	236	65.6%	3.7	5.4	47.4%	$32,800
8	440	73.2%	3.1	5.2	57.0%	$38,400
12	3,836	65.9%	3.1	5.4	42.9%	$38,772
13	3,426	69.4%	3.0	5.2	46.6%	$39,600

SOURCE: Estimated from Census Block and Tract Statistics, U.S. Bureau of the Census, 1980 Census of Housing and Population

center. More recently, the area has been attracting other industries with low taxes, relatively low wages, and a large pool of available labor. Seymour Johnson AFB is the largest employer in the county and plays a vital role in its economy.

Table 3.7-8 displays the structure of the Wayne County economy in terms of employment by major industrial categories. As can be seen, over half of total nonagricultural employment in the county can be found in manufacturing and in wholesale and retail trade. The latter has grown fairly rapidly during the first half of the decade, while growth in the former has been sluggish in comparison. Employment by the construction industry has been rapid in response to overall economic growth and diversification, and a healthy growth rate has been enjoyed by the transportation, communication and utilities industry.

Within manufacturing, major employers include the food and kindred products industry, manufacturers of textile mill products, producers of apparel and other textile products, furniture producers, the footwear and other leather products industry, producers of electrical and electronic equipment, and the motor vehicle parts industry. Each of these industries employs 500 or more area residents.

The Wayne County economy suffered during the recession of 1982 with a 1.9% decline in employment. The economy bounced back, however, with 1983 employment levels greater than those for 1981. The growth in total employment averaged 2.9% per year between 1981 and 1985. This is in contrast to total employment for North Carolina as a whole, which exhibited a 2.1% average annual growth rate over the same period, and to total employment for the United States which logged a growth rate of only 1.7%.

3.7.1.5. The Role of Seymour Johnson AFB

In many respects, Seymour Johnson AFB functions as does a civilian community, providing many of the essential services required by any small town. Recreational facilities, a Base exchange, and other facilities are located on the Base to serve military and civilian personnel assigned to the base.

Families of Seymour Johnson AFB personnel residing in base family housing attend school in the surrounding communities. Moreover, many of the military personnel assigned to the Base, as well as all of the civilians, live off the Base in surrounding communities.

In fiscal year 1984, total assets, including aircraft, equipment, buildings and land, amounted to over $1.76 billion. The total payroll for military personnel and civilian personnel was over $116 million. Payrolls for other employees on the base totalled over $2.5 million. Military personnel numbered 5,485 and there were 497 civilians assigned to the Base. Base services employed another 512 persons. Military personnel had with them over 13 thousand dependents. The Base let contracts for services, construction, modifications, alterations, supplies and equipment totaling over $26.7 million of which over $10 million were awarded in the state of North Carolina. Nearly $6.6 million was awarded to

TABLE 3.7-8

STRUCTURE OF THE WAYNE COUNTY ECONOMY

	1981	1982	1983	1984	1985	Average Annual % Growth 1981 to 1985
Nonagricultural Employment	27,687	27,151	28,584	30,224	31,069	2.9
Construction	1,897	1,823	1,986	2,362	2,344	5.4
Manufacturing	8,183	7,867	8,014	8,315	8,470	0.9
Transportation, Communication and Utilities	1,161	1,116	1,242	1,316	1,369	4.2
Wholesale, Retail Trade	6,946	6,880	7,621	8,261	8,630	5.6
Finance, Insurance and Real Estate	1,957	1,059	1,118	1,166	1,194	2.8
Services	3,403	3,371	3,476	3,580	3,690	2.0
Civilian Government	5,040	5,035	5,127	5,224	5,372	1.4

SOURCE: Department of Commerce, Bureau of the Census and Data Resources, Inc. estimates.

businesses and individuals in the Goldsboro area. Educational Impact Aid funds provided to area schools by the federal government totaled $859,000.

Direct, indirect and induced impacts of Seymour Johnson AFB on wages and salaries, production and employment in Wayne County, the state of North Carolina, and the United States as a whole are described below. As described earlier, the total payroll at Seymour Johnson AFB in FY 1984 was about $118.7 million. This estimate includes $105 million for military personnel and $10.8 million for civilian personnel. Non-appropriated fund services paid $1.35 million in wages and salaries, while the Base exchange paid about $0.99 million in wages and salaries.

Estimated total direct wages and salaries for 1985 are $125.0 million, an increase of about 5.3% over 1984. The 1985 estimate includes $116.5 million for military and civilian personnel and $2.4 million for non-appropriated fund services and Base exchange employees.

Direct production estimates for Seymour Johnson AFB are based on total wages and salaries paid to military and civilian personnel assigned to the Base plus estimates of total output by Base services and operating expenditures. The estimated total direct production impact for Seymour Johnson AFB in 1985 is $166.4 million. This estimate includes about $5.3 million for construction projects, 8.3 million as a measure of the output of non-appropriated fund services and the Base exchange, and $24.7 million in operating expenditures.

In 1985, Seymour Johnson AFB provided an estimated 6,504 jobs. This estimate includes 6,005 personnel assigned to the Base (5,506 military, 499 civilian) plus 110 employees in the Base exchange and 237 employees in non-appropriated fund services. The estimated total employment in 1985 reflects an increase of less than 0.4% over the 1984 estimate.

The economic impact of Seymour Johnson AFB on local communities, North Carolina state, and the nation as a whole goes far beyond the direct impacts outlined above. Wages and salaries earned on the Base are spent in large part within Wayne County, and to a lesser extent in other parts of North Carolina, the South Atlantic region, and other states. These expenditures for goods and services in turn create jobs and incomes for those providing the goods and services. Similarly, expenditures by the base for materials, equipment and services necessary for operations by the base generate production, jobs and incomes.

The indirect and induced impacts of Seymour Johnson AFB on wages and salaries in 1985 is estimated at $95.2 million, bringing the total wage and salary impact to $220.1 million. Total production impacts are estimated at $542.8 million, of which $376.4 are indirect and induced. In addition to the 6,364 jobs provided at Seymour Johnson AFB, 4,345 jobs result indirectly due to outlays by the base.

These summarized estimates reflect an economic multiplier of about 3.26. That is, each dollar of expenditure by Seymour Johnson AFB (for wages and salaries, materials, equipment, supplies and services), generates about $3.26 in economic

activity (in terms of output or production). The employment multiplier is about 64 jobs per million dollars in outlays. The impacts are spread across all regions of the country, but they are concentrated in the local areas as discussed below. Estimates by region may be found in Table 3.7-9.

Out of $95.2 million in indirect and induced wages and salaries resulting from Seymour Johnson AFB expenditures, about $40.5 million or 42.5% is earned by residents of Wayne County. This brings the total wage and salary impact, including direct wages and salaries, to $165.5 million, representing nearly 75.2% of the total wage and salary impact in 1985.

The local industries in which much of the indirect and induced wages and salaries are paid include miscellaneous services, wholesale and retail trade, the construction industry, the finance and insurance industry, utilities and business services

Total production impacts of Seymour Johnson AFB in Wayne County are estimated at $313.6 million, or about 57.8% of the total production impact. Of this amount, about $147.2 million results indirectly. The most affected local industries in terms of the value of output are the construction industry, utilities, miscellaneous services, wholesale and retail trade, and real estate and rental.

The total employment impact of the Base on Wayne County is estimated at 8,392 jobs in 1985. This estimate includes the 6,364 jobs on the Base itself plus 2,028 jobs created indirectly as the result of Base outlays.

The largest providers of these jobs are the construction industry and service industries, particularly wholesale and retail trade, utilities, eating and drinking places, and miscellaneous services. The impacts of Seymour Johnson AFB on counties of North Carolina other than Wayne County are relatively small, owing to the general lack of industry that would directly or indirectly support the base. The increment on total wages and salaries is about $4.5 million; the increment on total production is about $18.3 million. These factors combine to create about 196 jobs in North Carolina outside of Wayne County. Estimates of the total impacts of Seymour Johnson AFB on the State of North Carolina including Wayne county are $170 million for wages and salaries, $331.9 million for production, and 8,588 jobs in 1985.

The total wage and salary impact of Seymour Johnson AFB on the State of North Carolina is estimated at $170 million. Almost three-fourths of this amount is paid to Base personnel and other employees at Seymour Johnson AFB itself. An additional $45 million in wages and salaries are earned as an indirect consequence of expenditures by the Base and its personnel. The major industries providing these wage and salary payments are miscellaneous services, wholesale and retail trade, finance and insurance, and the construction industry.

Production impacts of Seymour Johnson AFB on North Carolina total $331.9 million, including the $166.4 million estimate of direct production impacts by the base. Major industries in the state that are affected indirectly include

TABLE 3.7-9

REGIONAL IMPACTS OF SEYMOUR JOHNSON AFB, 1985

	Wayne County	North Carolina	Total
Wages and Salaries (Millions of 1985 Dollars)			
Direct	125.0	125.0	125.0
Total	165.0	170.0	220.1
Production (Millions of 1985 Dollars)			
Direct	166.4	166.4	166.4
Total	313.6	331.9	542.8
Employment (Number of Persons)			
Direct	6,364	6,364	6,364
Total	8,392	8,588	10,709

SOURCE: Data Resources, Inc. estimates.

utilities, miscellaneous services, real estate and rental, wholesale and retail trade, and construction.

Of the total employment impact of 8,588 North Carolina jobs resulting from Seymour Johnson AFB outlays, 6,364 can be found at the base itself. The remaining jobs are concentrated primarily in miscellaneous services, wholesale and retail trade, construction, eating and drinking places, and finance and insurance.

As discussed earlier, the total impacts of the base on wages and salaries in 1985 was $220.1 million. Impacts on production totaled $542.8 million and the base is the direct or indirect source for 10,709 jobs. Much of the impact is experienced outside of Wayne County, and outside of North Carolina. About 23% of the wages and salaries, 39% of the production and 20% of the employment impacts are located in other states.

The total wage and salary impact of $220.1 million includes $125 million in direct wages and salaries plus $95.2 million in indirect and induced wages and salaries. The direct wage and salary impact is located, of course, entirely in Wayne County. About 53% of the indirect and induced impact on wages and salaries is felt outside of North Carolina. The major contributors to this wage and salary impact, other than the AFB itself, include wholesale and retail trade, business services, miscellaneous services, finance and insurance, and transportation and warehousing.

Production impacts of $542.8 million are distributed 58% to Wayne County, about 3.4% to other counties in North Carolina, and about 39% to other states. Of the total impact on production, about 31% is direct and about 69% is indirect and induced. Industries whose production is significantly affected by Seymour Johnson AFB include utilities, real estate and rental, wholesale and retail trade, miscellaneous services, construction, food and kindred products, petroleum refining, crude oil and natural gas, finance and insurance, and transportation and warehousing. These ten industries account for about 43% of the total production impact, or about 60% of the indirect and induced production impact.

Total employment impacts follow similar patterns. In 1985, Seymour Johnson AFB was directly responsible for 6,364 jobs. Another 4,345 jobs were created indirectly as a consequence of outlays by the Base and its personnel. About 78.4% of the total jobs were located in Wayne County, 1.8% in other North Carolina counties, and the rest in other states. The industries that are the major employers affected by Seymour Johnson AFB include wholesale and retail trade, miscellaneous services, construction, business services, eating and drinking places, and finance and insurance services.

3.7.2. Baseline Projections to 1991

3.7.2.1. Overview

The proposed action will have its impacts felt through the year 1991 and beyond. In the near term, Seymour Johnson AFB will experience changes as various activities are phased out while the new program is phased in. In order to assess the impacts of the new program, a baseline projection has been developed assuming no introduction of this program so that it may be compared and contrasted with a projection that embodies the introduction of the program.

An assessment of the impacts of the proposed action must be couched in terms of the economic environment in which it will occur. Hence the following paragraphs describe the basic underlying socioeconomic assumptions that will affect and be affected by Seymour Johnson AFB with or without the new program.

3.7.2.2. Demographics

The total population of Wayne County is expected to climb to about 106,096 by 1991, reflecting an average annual growth rate of almost 1.1% per year. The county growth rate compares to an average growth rate of 0.9% for the United States over the same period. The expected population growth rate for Wayne County is slightly less than the historical population growth rate over the last 10 years. Out-migration from the county represents the major source of population drain during the period. Under the growth rate assumptions, the population of Wayne County will fall to approximately 1.6% of the State population, which is expected to be 6,645,000 by 1991.

3.7.2.3. Land Use Plan

As discussed earlier, Goldsboro planning boundaries extend one mile from the current city limits, and the city can exercise the option of zoning control over this area. In addition, the City of Goldsboro Planning Department has defined several urban study areas outside the planning perimeter which include development districts falling partially within the current AICUZ boundaries. Together, these areas are known as the Goldsboro Urbanized Region. A draft land use plan has been developed by the City of Goldsboro which discusses future development directions for this urbanized region including Goldsboro, the New Hope, and Mar-Mac/Brogden areas. These areas represent the most significant developing areas from the standpoint of planning for compatible land use. The Wayne County land use plan was completed in 1978 and has not been updated due to general resistance to zoning regulations by County residents.

The New Hope/Route 1003 area will be the most important growth area in Goldsboro during the next 20 years. The long-range plan for Goldsboro suggests that 65% of the area's residential growth during the next several decades could take place within this important area. Overall, almost 7,700 people are expected to move to the New Hope area over the planning horizon, resulting in 3,200 new dwelling units.

The city is expected to pursue a policy of selected urbanization and annexation of this area in conjunction with a cooperative agreement with Wayne County. The major policies under consideration by the city and county would encourage orderly, planned commercial and residential development. The new residential uses proposed cover a total of 1,762 acres, or approximately 3.5 square miles. Single-family low-density residential would dominate the area. It is anticipated that townhouses and apartments would be interspersed among the residential areas. Most of the residential growth will take place along the corridor created by Best Drive and Wayne Memorial Drive.

The Mar-Mac/Brogden area is one of the larger study areas within the entire urban area as it contains approximately 20 square miles. The size of this area is put into scale when compared to the developed area of Goldsboro within the loop which contains approximately 5 to 6 square miles. The north and east boundaries of this area are the Neuse River.

This area is unique in that it consists of series of small to medium subdivisions that are separated by fairly short distances. It is characteristic of suburban developments taking place in rapidly growing areas. However, in most urban areas, the intervening vacant tracts are eventually filled and a continuous urban development results.

The Mar-Mac/Brogden area is expected to retain 10% of total urban growth during the planning period, resulting in a total of 500 dwelling units and 1,200 residents. A concentration is proposed rather than a continued scattering of subdivisions throughout the 20-mile area. As an alternate to the Gratham Road area, the plan suggests a filling in of the Brogden area along Route 1930 or north of the Woodfield subdivision along Route 1927.

Overall policies for urban growth within the Goldsboro area suggests that this study area will receive 10% of the residential growth during the planning period. This would mean that there would be a net gain of 500 dwelling units representing 1,200 persons of additional population. There will also be considerable "filtering up" with the demolition of less desirable dwelling units. This could result in hundreds of replacement units over a period of 20 years. Conversions of older, larger homes with apartment units will also occur. The end result could mean 700 to 1,000 new residential units during the planning period. The plan proposes 214 acres of low density residential and 201 acres of medium residential which more than adequately meets the need for 250 acres. It should be pointed out that the plan contemplates some townhouses and apartments within the proposed residential areas. It is anticipated that new residential developments will take place throughout the city as a part of the normal process of replacement. Small, older units will gradually be removed and newer units will be built as infill or replacement.

The most important industrial area in the plan is the 400± acre industrial area to the west of Bypass 117 along Highway 581. This area is bounded on the north by U.S. 70 and it extends down to the Southern railroad tracks. This area has an excellent location and high visibility from the Bypass.

The proposed land use plan divides the study area into 11 land use classifications. There are three proposed residential categories which would have varying densities. Rural residential would have a density of less than one dwelling unit per acre, low density residential would have one to two dwelling units per acre, medium residential would have two to four dwelling units per acre and high density residential would have over four dwelling units per acre.

The categories of the land use plan are:

Existing Residential: This includes all residentially-developed areas within the study area regardless of their use for single-, two- or multiple-family. In the rural areas this designation is general and there are vacant lots within the existing residential areas, as the plan attempts to show major concentrations of residential.

Rural Residential: These are areas that are expected to be developed with large lot single-family residences. There would, of course, be other compatible uses within these residential areas such as schools, churches and other public or quasi-public uses.

Low Density Residential: These areas would be used for residences and public uses with lots ranging in size from 12,000 to 16,000 square feet. Medium Density Residential: There are areas that would have densities ranging from two to four units per acre.

Major Retail: This category attempts to identify the locations of major retail facilities that contain large stores. It should be recognized that these are not the only areas for which retail would be permitted in the plan.

General Commercial: This is the largest and all-inclusive commercial category on the plan. It includes a wide range of commercial uses including general business, retail, offices and service uses. The plan does not attempt to show small, scattered, commercial parcels.

Major Office: This designation is shown on the plan to denote areas that should be set aside exclusively for future office parks. The plan suggests that these areas be reserved and developed as office parks without the intrusion of other commercial activities.

Industrial: This includes the full range of light and heavy industrial uses. In some instances, this category covers older existing industrial areas. In other instances, it embraces areas that should be set aside and reserved for "clean" industrial activities and industrial parks.

Public and Semipublic: The larger tracts of land set aside for public and semipublic uses including schools, parks, public buildings, and institutional uses are included in this category. Due to the scale of the plan, no attempt was made to show all of the public and semipublic uses on small parcels.

Open Space: This includes all the areas within the floodways that should not be developed for urban purposes.

All of the areas on the plan that have no designation are agricultural. There are, of course, many existing residences and farm houses within this area and it is anticipated that residences will be built in these areas in the future. The intent of the plan is to suggest that these areas not be developed with major subdivisions.

All of the categories of planned land use were measured by study area for each of the use categories. The proposed land use acreage for each category are shown on Table 3.7-10.

3.7.2.4. Structure of the Economy

The economy of Wayne County is projected to grow at a modest rate through the balance of the 1980's. Growth rates for different sectors of the Wayne County economy are summarized in Table 3.7-11. Total nonagricultural employment is projected to top 34 thousand persons by 1991, reflecting an average annual growth rate of 1.6% over the 1985 level of 31 thousand persons. Service industries will log the fastest growth rates, while construction employment is projected to decline. Manufacturing employment is projected to increase at nearly double the rate recorded for the first half of the decade. Key manufacturing industries include electrical and electronic equipment and motor vehicle parts.

3.7.2.5. The Role of Seymour Johnson AFB

Seymour Johnson AFB will continue to play a significant role in the Wayne County and North Carolina economies with or without the special aircraft beddown proposed. The baseline projection assumes that the number of military and civilian personnel assigned to Seymour Johnson AFB will remain unchanged from its 1985 level; then levels are identified in Table 3.7-12. It is consequently assumed that the number of persons working at the base exchange and at nonappropriated func services will also remain unchanged from its 1985 level. Hence the payroll assumptions in the baseline projection are held constant as are the assumed levels of outlays for base operation and maintenance and construction activities.

The impacts of the Base on wages and salaries, production and employment in Wayne County, North Carolina and the United States as a whole through the six year baseline forecast horizon are virtually the same as those described for 1985 above. All direct impacts are identical, but due to improvements in labor productivity and slight shifts in the degree of specialization of the different regions, indirect and induced impacts are projected to be slightly lower in the baseline forecast. Estimates are summarized in Table 3.7-13.

The estimated 1991 economic multiplier is not much different than that estimated for 1985. Dividing the total production impact estimate of $525.1 million by the direct production estimate of $166.7 million yields an economic multiplier

TABLE 3.7-10

PROPOSED INCREASES IN LAND USE ACREAGE
BY URBAN STUDY AREA

Use	Goldsboro	New Hope	Brogden Mar Mac
Existing Residential	3,836	2,043	2,352
New Residential	415	1,762	755
Major Retail	442	37	38
General Commercial	367	233	174
Major Office	204	272	0
Industrial	2,446	450	460
Public/SemiPublic	609	240	152
C.B.D.	140	0	0
Open Space	1,266	1,222	1,302

SOURCE: City of Goldsboro Planning Department

TABLE 3.7-11

PROJECTIONS OF ECONOMIC GROWTH FOR WAYNE COUNTY

	1985	1991	Average Annual % Growth 1985 to 1991
Nonagricultural Employment	31,069	34,238	1.6
Construction	2,344	2,131	-1.6
Manufacturing	8,470	9,382	1.7
Transportation, Communication and Utilities	1,369	1,498	1.5
Wholesale, Retail Trade	8,630	9,675	1.9
Finance, Insurance and Real Estate	1,194	1,370	1.9
Services	3,690	4,180	2.2
Civilian Government	5,372	6,002	2.0

SOURCE: Data Resource, Inc. estimates.

TABLE 3.7-12

BASELINE ESTIMATES FOR MANPOWER
AT SEYMOUR JOHNSON AFB

Military Personnel	5,506
Civilian Personnel	499
Base Exchange	237
Nonappropriate Fund	167
Other	167
	6,519

TABLE 3.7-13

SUMMARY ESTIMATES OF THE REGIONAL IMPACTS OF SEYMOUR JOHNSON AFB
BASELINE PROJECTION

	1985	1986	1987	1988	1989	1990	1991
Wages and Salaries (Millions of 1985 Dollars)							
Wayne County	165.5	164.8	163.9	163.5	163.1	162.6	162.2
North Carolina	170.0	169.1	168.1	167.7	167.2	166.7	166.3
Total	220.1	218.4	216.1	215.0	213.8	212.5	211.4
Production (Millions of 1985 Dollars)							
Wayne	313.6	313.0	311.5	311.0	310.5	310.0	309.6
North Carolina	331.9	331.2	329.3	328.8	328.1	327.5	327.0
Total	542.8	540.0	534.1	531.8	529.4	527.1	525.1
Employment (Number of Occupants)							
Wayne County	8,392	8,346	8,296	8,262	8,224	8,186	8,149
North Carolina	8,588	8,536	8,479	8,441	8,399	8,356	8,314
Total	10,709	10,595	10,464	10,380	10,288	10,197	10,108

SOURCE: Data Resources, Inc. estimates.

of about 3.15 after taking direct, indirect and induced impacts into effect. The employment multiplier, derived by dividing the total employment impact of 10,108 jobs by the direct production estimate of $166.7 million yields an estimate of 61 jobs per million dollars of Seymour Johnson AFB outlays.

3.7.3 Dare County Range

3.7.3.1. Socioeconomic Considerations

The DCR is uninhabited, contains no commercial or industrial establishments, and is not used for agricultural or livestock purposes. Consequently, there are no economic considerations associated with the use of the range by aircraft from Seymour Johnson AFB.

3.7.4. Training Routes

3.7.4.1. Socioeconomic Considerations

Training routes out of Seymour Johnson AFB to the range affect numerous North Carolina counties. The routes are restricted with respect to altitudes and proximities to residential areas and economic pursuits. There is no evidence that military operations along the training routes have had any significant direct economic impact, positive or negative. Secondary or diffuse impact on the residents of the counties along the training routes is positive to the extent that military installations contribute to the general economy and job market, particularly in the Goldsboro area, and to the extent that residents seek employment in those areas. Data on population, housing, per capita income in the area underlying the MTRs are provided in Tables 3.7-14 and 3.7-15.

TABLE 3.7-14

INCOMING DATA FOR AREAS UNDERLYING
THE SEYMOUR JOHNSON MILITARY TRAINING ROUTES

Population and Income - 1985

	IR012	IR721	VR058	VR073	VR096	VR1043	VR1046	VR1074	VR1752	VR1753
Population	63579	246111	219778	45324	181924	134207	74733	59866	260009	64974
Average Annual % growth 1980-95	1.1	0.9	1.2	1.0	0.3	1.0	1.1	1.4	0.4	1.2
% White	64	89	96	55	77	70	65	67	7	55
% Black	35	11	3	45	22	28	34	33	2	44
% Other	1	1	1	0	1	3	1	1	1	1
Median Age	32	34	34	33	33	31	32	33	33	32
Total Income (M$)	505.1	2310.5	1633.4	325.4	1661.4	1152.2	641.5	489.1	1933.9	539.9
Per Capita Income	7945	9388	7432	7179	9132	8585	8584	8169	7438	8309
Average Annual % Growth (1970-1980)	8.9	8.8	9.0	9.0	9.0	9.0	10.3	9.0	9.0	10.3

TABLE 3.7-15

HOUSING DATA FOR AREAS UNDERLYING
THE SEYMOUR JOHNSON MILITARY TRAINING ROUTES

Housing Characteristics - 1980

	IR012	IR721	VR058	VR073	VR096	VR1047	VR1046	VR1074	VR1752	VR1753
Total Housing Units	23742	91505	83847	21366	67337	50675	27663	23009	99554	25506
% Owned	72	75	78	74	72	67	67	73	76	76
% Single Family	74	78	80	81	77	75	76	74	81	82
% Mobile Home	13	8	13	13	7	9	11	13	11	12
% Built 1970 or later	32	31	35	33	28	32	30	34	29	37
Median Persons Per Unit	2	2	3	2	2	2	2	2	3	3
Average Home Value (000$)	37.9	43.0	33.2	34.1	38.9	41.5	38.4	40.8	32.8	42.0
Median Home Value (000$)	32.8	38.1	28.6	27.2	34.4	35.0	33.9	35.0	29.6	36.8
Median Gross Rent	179	204	169	169	198	203	186	185	163	197

3.8. Archaeology

A complete archaeological survey has never been done for Wayne County. Much work has been done in Wayne County to identify those buildings that have architectural and/or historical significance. The 1977 inventory of those buildings is contained in the "Land Use Plan, Wayne County, North Carolina" (1978). There are no reported sites on the Seymour Johnson AFB. However, the North Carolina Department of Cultural Resources has identified three sites in the Goldsboro area. These sites are the Civil War Camps of the 15th U.S. Corp (Union), the 17th U.S. Corp (Union) and Davis' Brigade (Confederate) and are located across Stoney Creek from the Base. Coordination with the State Historic Preservation Officer (SHPO) has revealed no archaeological resources on Seymour Johnson AFB. The SHPO has concurred that no additional survey requirements are necessary.

The DCR was inspected by a staff member of the North Carolina Division of Archives and History on October 4, 1978 for the possible presence of significant archaeological resources. The inspection revealed that the possibility of significant archaeological resources being present is extremely remote. Observation of training activities on the range indicated that the area disturbed by practice runs contained no archaeological resources.

Areas along the Alligator River, Whipping Creek, and Lake Worth also were inspected. The staff member concluded that the river had eroded its bank to the extent that any sites that may have been present have been washed away. It was also concluded that the extremely swampy conditions around Lake Worth and Whipping Creek preclude the presence of any significant sites.

The MTRs to be used by the F-15Es cross some 34 archaeological sites recognized by the North Carolina Department of Cultural Resources. A number of the sites such as Indian or early colonial settlements are of historical significance. Many of the sites are prehistoric with no above-ground remains. These areas have not been fully surveyed and undiscovered sites are likely to exist.

3.9. Aesthetics

Because of the industrial nature of operations at Seymour Johnson AFB, the aesthetic value of the Base is limited. The Cliffs of the Neuse State Park, approximately 8 miles southeast of Seymour Johnson AFB, is aesthetically important for visitors interested in the natural relief of the area. (See Section 3.3.6.)

Bentonville Battlefield Historical Monument and Laurel Lake Gardens are located within the land-projected boundaries of Echo MOA. Bentonville Battlefield is in the southern part of Johnston County and Laurel Lake Gardens is in Sampson County. Visitors are attracted to these site for their historical and natural resources.

The DCR, located within the Atlantic Coastal Plain, is an area characterized by bogs, pocosins, marshland, and swamps. The range terrain itself is flat and drained by perimeter canals affording little opportunity for scenic views. The active portion of the range is maintained in an open condition by regular clearing and controlled burning, although the area surrounding the open portion of the range is wooded with dense undergrowth. This gives the range environs many of the qualities found in wilderness areas.

As discussed in Section 3.4.4, there are several national wildlife refuges surrounding the range. The range also is located in a Natural Area as defined by the North Carolina Natural Heritage Program (NHP). The NHP considers an area that contains significant natural features such as unique or rare species, habitats, plant communities and geologic formations or combination thereof to be of preservation priority. MTRs leading to and from the range, notably VR-73 and VR-1043, pass over aesthetically important areas such as Cape Hatteras and Cape Lookout National Seashores.

4.0 ENVIRONMENTAL CONSEQUENCES

4.0 ENVIRONMENTAL CONSEQUENCES

The proposed beddown of F-15E aircraft at Seymour Johnson Air Force Base (AFB) would result in a one-for-one exchange of F-15E aircraft for the 72 F-4 aircraft that presently comprise the 4th Tactical Fighter Wing (TFW). Utilization of the aircraft would remain essentially unchanged. There would be no significant change in the total number of sorties per day. There would be a shift in mission emphasis from the air-to-air emphasis for the F-4s to an air-to-ground emphasis for the F-15Es. The scheduling of F-15E sorties over the Dare County Range (DCR) and proposed military training routes (MTRs) would undergo a shift to more nighttime sorties (6:00 P.M. to 10:00 P.M.).

The scheduling of F-15E sorties cannot be extended either into the "quiet hours" between 2230 and 0600 or into the weekends for reasons already stated in Section 2.0. The only viable alternative times for sortie scheduling, therefore, are various dispersements before and after sunset up to 2200 hours during the five-day operational week. These limited alternatives are discussed as appropriate under the various sections.

Local airspace operations at Seymour Johnson AFB would remain the same, except for the greater number of sorties later in the day as required by the F-15E Low Altitude Navigation and Targeting Infrared for Night (LANTIRN) mission emphasis. The airspace and tactical ranges currently used by the 4 TFW would continue to be utilized. The areas proposed for principal use would be Echo military operations area (MOA), airspace W-122 (Figure 3.0-3), and DCR (Figure 3.0-2). The shift in mission emphasis for the F-15E LANTIRN mission would result in a 48 percent decrease in airspace requirements for air-to-air operations and a concurrent increase in MTR and air-to-ground range requirements.

While there are no current plans for range construction, on-ground activities in support of the LANTIRN mission may consist of future construction and maintenance of infrared targets. The heat source for these targets could be powered by a gas generator, battery, or electrical power.

Since the deep peat soils of DCR present risks from fire hazards about five months per year, a cold smoke spotting charge is used for scoring of bombing runs during this period. At other times a flash-producing ordinance is used both day and night. Mitigative measures that relate to fire potentials due to accidental fuel spills are addressed in Section 4.4.7.

4.1. Air Quality Impacts

4.1.1. General Approach

An air quality impact analysis of the beddown of F-15 aircraft at the Seymour Johnson AFB, MTRs and DCR was performed to determine the level of significance of potential impacts on local air quality. A major part of the air quality analysis consists of establishing the future air quality in the areas of maximum carbon monoxide (CO), hydrocarbons (HC), nitrogen dioxide (NO_2), particulate matter (PM), and sulfur dioxide (SO_2) impacts. This was accomplished by using atmospheric dispersion models for air quality at the Base, coupled with an analysis of the current air quality at the Base, MTRs and Range.

The first phase of the air quality impact study characterized the net emission changes at the Base. The second phase involved the modeling of aircraft emissions to determine the potential impacts on air quality standards. The following section contains this analysis. The model used for obtaining the impacts was the Aircraft Air Pollution Emission Estimation Techniques (ACEE) model. The ACEE model was developed by the Air Force Engineering and Services Center at Tyndall AFB and is based upon the Air Quality Assessment Model.

The air quality dispersion analysis, for all time frames, is based on the worst-case, one-hour modeled dispersion impact analysis. The time frames analyzed and the maximum number of aircraft within each time frame are shown in Table 4.1-1.

The worst-case 1-hour model impacts are factored to produce a conservative estimate of the 3-, 8-, 24-hour, and annual impacts. Larsen's Technique (Larsen, 1971) assumes a representative standard deviation of monitored 1-hour values for monitor sites to obtain a more representative annual conversion factor. The standard deviations for Washington, D.C., for NO_2 and SO_2 were assumed for the North Carolina area (Larsen, 1971). This produced annual time frame conversion factors for converting a 1-hour impact to the annual impact estimate for NO_2 and SO_2 . An annual factor of 0.10 was used for PM. Table 4.1-2 summarizes the U.S. Environmental Protection Agency (EPA) time factors used for the conversions of a 1-hour impact to other time frames.

The EPA has set significance levels for air quality dispersion modeling analyses. If a modeled impact is less than those values as seen in Table 4.1-3, the impact from the source is defined to be insignificant.

4.1.2. Model Results

The technique for calculating aircraft emissions, as discussed in Section 4.1.1 was used to calculate the emissions from a single F-15 LANTIRN aircraft. Additional modes of aircraft emissions at the Base were not included. The aircraft fuel flow rates, emission factors, length of each aircraft mode, fuel usage, and the emission rate for each mode are detailed in Appendix D.

TABLE 4.1-1

AIRCRAFT TIME FRAME SUMMARY

Time Frame	Maximum Number of Aircraft Per Time Frame
1-hour	12
3-hour	35
8-hour	35
24-hour	35
Monthly	612
Seasonal*	2,448
Annual*	7,344

*Assumes at most 1440 sorties per month.

TABLE 4.1-2

EPA TIME FRAME CONVERSION FACTORS

1-Hour	3-Hour	8-Hour	24-Hour	Annual
1.0	0.9	0.7	0.4	0.139 (for NO_2) 0.079 (for SO_2) 0.139 (for PM)

Source: Budney, 1977.

TABLE 4.1-3

SIGNIFICANCE LEVELS

Pollutant	Annual	Time Frame 24-Hour	8-Hour	3-Hour	1-Hour
SO_2	1.0 ug/m^3	5 ug/m^3	-	25 ug/m^3	-
TSP	1.0 ug/m^3	5 ug/m^3	-	-	-
NO_2	1.0 ug/m^3	-	-	-	-
CO	-	-	500 ug/m^3	-	2000 ug/m^3

Source: 40 CFR, Part 51, Subpart Q, Appendix S, 1984.

The impacts at various downwind distances from the Base were calculated. The closest off-Base impacts are represented by those occurring at the five km distance. The impact at the closest city is represented by the impacts at the 10 km distance. Table 4.1-4 summarizes the worst-case air quality impact near the Base due to the F-15 LANTIRN takeoffs and landings. In all cases, this value is less than the one-hour average significance level, and the value for F-15Es is usually less than and never more than the corresponding value for F-4s. This assumption seems rational since operations at the Base did not generate enough pollutants to cause any of the National Ambient Air Quality Standards (NAAQS) to be exceeded.

For the reasons discussed in Section 3.1, air quality impacts for the DCR and the MTRs were not quantitatively estimated. While the number of sorties in each MTR will increase, the affected MTRs are spread over a much broader area than is currently the case. It is thus expected that air quality impacts in MTR airspace will not be significant. This assumption seems rational since operations at the Base did not generate enough pollutants to cause the NAAQS to be exceeded. Operations at the Base would be more frequent and concentrated than on the MTRs.

4.1.3. Cumulative Impacts

The cumulative impact of the proposed action at Seymour Johnson AFB is a small reduction in the worst-case air pollutant concentrations attributable to aircraft flight operations. Since the region is an area in which air quality is considered better than required by the NAAQS there will be no change in that status. At the DCR and for those MTRs currently utilized for F-4 operations, the proposed action will result in small reductions in air pollutant concentrations.

4.1.4. Mitigative Measures

Because there are no significant impacts to air quality at the Base, range, or MTRs, no mitigative measures are required for the proposed action.

4.1.5. Unavoidable Adverse Impacts

There are no unavoidable adverse impacts of aircraft air emissions associated with the proposed action.

4.1.6. Human Health Considerations

As seen in Table 4.1-4, the worst-case impacts due to the LANTIRN activity at the Base are insignificant for all pollutants. The area near the Base actually will experience an improvement in air quality as seen in Table 4.1-4. The LANTIRN related impact for these pollutants is less when the improvement in air quality from the F-4 removal is taken into account. The area near the Base

TABLE 4.1-4

SUMMARY OF IMPACT ANALYSIS[1] - BASE ACEE MODEL RESULTS

Pollutant	Time Frame	F-15 5 km Worst-Case Impact (ug/m^3)	F-4 5 km Worst-Case Impact (ug/m^3)	F-15 10 km Worst-Case Impact (ug/m^3)	F-4 10 km Worst-Case Impact (ug/m^3)	Significance Level (ug/m^3)
CO	8-hour	2.33	4.01	1.84	3.22	500.0
	1-hour	9.12	15.72	7.20	12.60	2000.0
HC_2	3-hour	1.16	2.42	0.84	2.10	-
NO_2	Annual	0.04	0.04	0.02	0.02	1.0
PM	Annual	0.001	0.007	0.001	0.004	1.0
	24-hour	0.006	0.035	0.006	0.018	5.0
SO_2	Annual	0.005	0.005	0.003	0.003	1.0
	3-hour	0.061	0.047	0.029	0.029	25.0
	24-hour	0.732	0.840	0.525	0.525	5.0

[1] Using Washington, D.C. 1-hour standard deviation in the calculation of the annual impact estimate.

[2] See Section 3.1 discussion of the relationship of the HC impact estimate to the ozone 1-hour standard.

is presently in attainment of all of the SO_2, NO_2, and CO standards. Thus, the LANTIRN aircraft impacts, when added to the present air quality, should be acceptable.

It is unlikely that the NAAQS would be exceeded at or in the vicinity of Echo MOA, DCR or the MTRs. Therefore the level of activities in these areas would pose no hazard to human health or welfare.

4.2. Noise Impacts

4.2.1. Impacts of Proposed Action

The proposed action will result in a one-for-one exchange of the existing 72 F-4 aircraft with new F-15E aircraft. Utilization of the aircraft should be essentially the same. There will be a shifting of the training mission from an air-to-air emphasis to air-to-ground emphasis. Local air operations which define the Base noise environment will remain basically the same.

The proposed LANTIRN deployment will require nighttime training sorties. This will result in an increase in after dark take-offs and landings. The daily sorties between 6:00 P.M. and 10:00 P.M. are expected to increase from 5 to 18. In addition daily landings after 10:00 P.M. will increase from 0.5 to 3. Shifting flight operations past 10:00 P.M. could raise the Base day-night average sound level (DNL), as noise events later than 10:00 P.M. are weighted with a 10 dB penalty.

The F-15E is a quieter aircraft than the F-4 on landing and takeoff. Furthermore, the number of aircraft departures utilizing afterburners should be reduced. Currently, F-4s use afterburners on all take-offs. The F-15E normally will not require afterburner assist on take-off except in warm weather. According to the NOISEMAP model projection shown in Figure 4.2-1, these factors result in a reduction in area affected by DNL values of 80 dB and greater, but increase the area affected by lower noise levels. A comparison of the noise affected areas for the baseline and the proposed action can be seen in Table 4.2-1.

While the change in acreage appears to be a relatively large increase (37%), it is pointed out that the current Air Installation Compatible Use Zone (AICUZ) (1983) shows 31,025 acres in the 65 DNL contour. For planning purposes this AICUZ is still valid today. Thus from a long term planning perspective, the proposed action would represent about a three (3) percent increase in acreage. From a simplistic point of view, the short term analysis (no action as compared to the proposed action) represents about a 1.4 dB change in overall noise impacts; whereas, the long term (1983 AICUZ to proposed action) represents about a 0.13 dB overall increase in noise.

Scheduling of the 4 TFW flight operations over DCR should undergo a shift to more nighttime activity due to the proposed action. Overall range utilization by the 4 TFW should increase due to the change in mission emphasis. Presently the DCR operates at about 78 percent utilization. This could rise to 94 percent depending on the availability of alternate ranges. Shifting to nighttime range sorties may result in longer operation of the range and will extend the noise environment past sundown. The DCR would continue to be a high noise level environment.

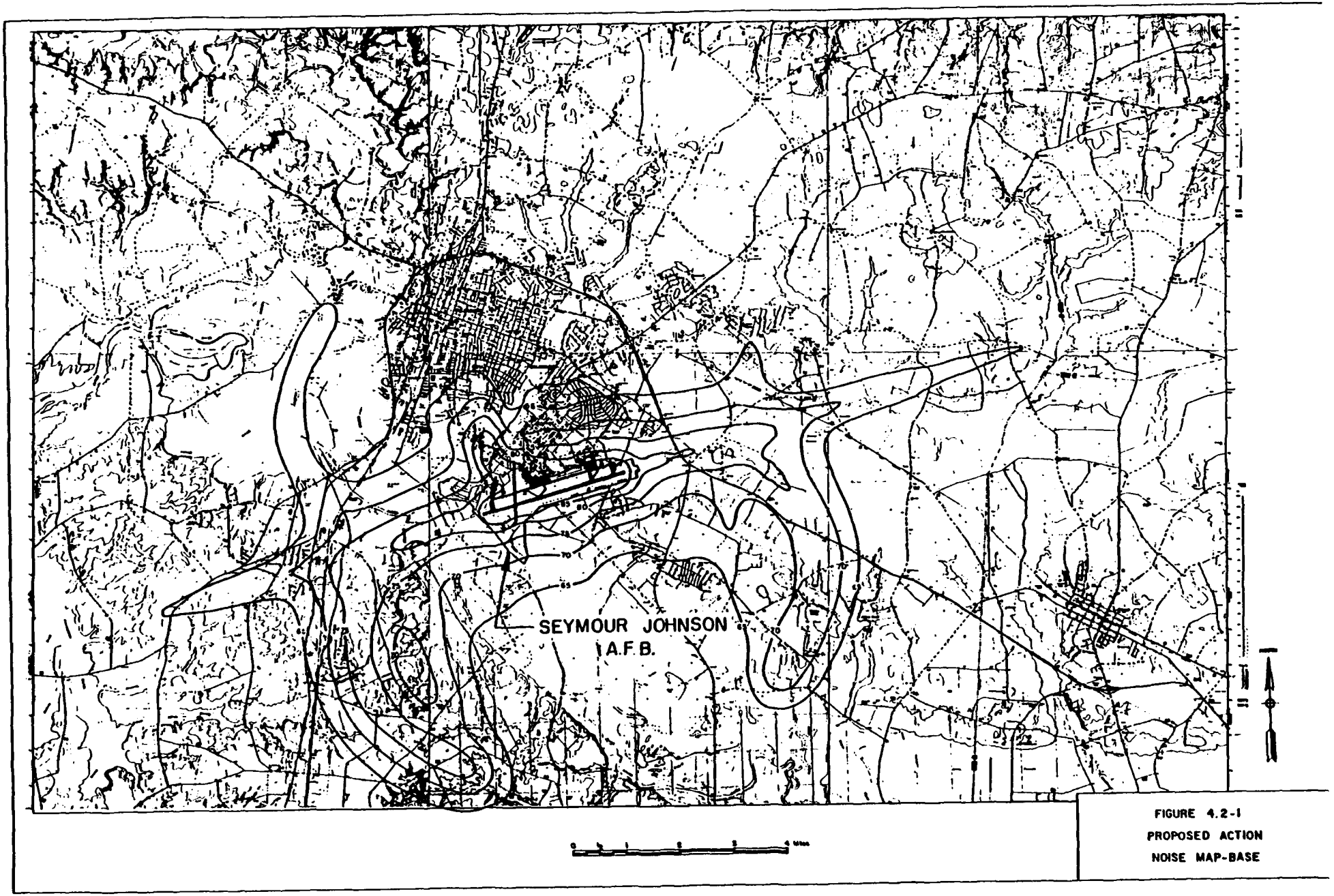

FIGURE 4.2-1
PROPOSED ACTION
NOISE MAP-BASE

TABLE 4.2-1

COMPARISON OF NOISE AFFECTED AREAS
SEYMOUR JOHNSON AIR FORCE BASE[1]
(In Acres)

DNL (dB)	1983 AICUZ (Fig. 3.2-2)	1986 No Action (Fig. 3.2-3)	Proposed Action (Fig. 4.2-1)	Variance
65	31,025.4	23,428.2	32,113.6	+ 8,685.4
70	8,460.4	11,111.1	17,327.8	+ 6,216.7
75	3,494.0	5,999.4	7,447.2	+ 1,447.8
80	1,805.9	3,593.5	2,555.9	- 1,037.6
85	1,143.2	2,320.2	1,198.4	- 1,121.6

[1] Acres are cumulative for listed DNL and greater.

SOURCE: Captain E. Taylor, personal communication, 7 and 11 February 1986

A reduction in utilization of Echo MOA for air-to-air missions will result from the air-to-ground emphasis of LANTIRN missions. Seymour Johnson-based F-15E aircraft would fly fewer air-to-air sorties in Echo MOA.

The LANTIRN training mission will require low-level sorties. While the total number of 4 TFW daily sorties will not change, the overall MTR utilization will be increased by 38 percent. This increase will be dispersed over ten existing MTRs (Table 4.2-2).

Desired minimum route altitude is 100 feet AGL; however, anticipated flight at that altitude would comprise only 20 percent of total operations. It is estimated that 30 percent of total low-level operations would be conducted at 300 feet AGL, and the remaining 50 percent at 500 feet AGL and above.

The expected noise exposure for the various MTRs is shown on Table 4.2-2. This approximation is based on a worst case scenario of 25 percent of the daily sorties flying over the exact same spot. The 20/30/50 percent altitude mix is factored into the calculation subject to the route's minimum altitude constraint. As evident from Table 4.2-2 the proposed action will result in a slight decrease in the expected noise level along the MTRs. Table 3.2-2 provides data on noise levels for different altitudes for single event overflights for F-15's and F-4's.

The noise level for rural environments ranges from 34 to 45 DNL-dB. F-15 aircraft passing at low-level over such areas can raise the overall noise level. The EPA considers noise levels below 55 DNL to have no effect on public health and welfare. EPA's recommendation of this value was made without concern for economic and technological feasibility and includes a very conservative margin of safety to protect the most sensitive portion of the American population. Consequently, the value is considered by the scientific community to be a goal rather than a standard. The Department of Housing and Urban Development (HUD) considers DNLs below 65 dB to be completely acceptable for residential purposes, recognizing a minor level of annoyance. The HUD value is adopted in this analysis for measuring impacts. From Table 4.2-2, it can be seen that for the worst case scenario all MTRs compared favorably with the HUD value. In all likelihood flights would be spread non-uniformly across the MTR corridor width which varies from 2 to 10 miles. With this dispersing of flight tracks the actual day-night average sound level would be much less than the predicted worst-case sound level.

The MTRs with the heaviest utilization and thus the highest potential noise levels are VR-1074, VR-1752, VR-1753, and VR-73. The routes transit to and from the range. The routes avoid heavily populated communities and are located over rural areas. VR-1752 crosses the southern part of Virginia destined for the mountains of North Carolina. LANTIRN training requires navigation over a variety of different terrains including mountainous regions.

TABLE 4.2-2

COMPARISON OF NOISE LEVELS FOR SEYMOUR JOHNSON MTRs [1,2]

MTR	Minimum [3] Altitude (ft.)	Estimated Annual Sorties Base Case	Estimated Annual Sorties Proposed Action	Base Case DNL (F-4s)	Proposed Action DNL (F-15s)
VR-073	100	2928	3278	55	54
VR-1074	100	4310	4890	57	56
IR-012	500	372	446	41	41
VR-058	100	276	314	45	44
IR-721	300	576	656	45	44
VR-096	500	564	639	43	43
VR-1752	SFC	1502	1682	53	51
VR-1753	500	2434	2772	49	49
VR-1043	200	868	988	50	49
VR-1046	200	1389	1667	52	50

NOTE:

1. Based on 25% of average daily sorties flying over the exact same spot.
2 Based on sorties broken down into following altitude mix:
   20 percent - minimum MTR altitude
   30 percent - 300 ft. AGL
   50 percent - 500 ft. AGL
3. Minimum altitudes are based on the altitudes charted by the FAA.

Table 4.2-3 shows the existing noise levels and populations along with the proposed action's cumulative noise levels for the various MTRs. It is emphasized that the number of people expected to be exposed to the noise levels described herein is considerably less than that shown in Table 4.2-3. This is due to the fact that the Air Force would continue to fly over the less populated areas of the MTRs. Only ten to twenty percent of the sorties would be flown at the 100 foot level, and these operations would be restricted to defined segments of the MTRs. Additionally, thirty percent of the sorties would be flown at an altitude of 300 to 500 feet and fifty percent would be flown at 500 feet and higher. The Air Force is sensitive to noise issues and continually reviews operations to minimize community impacts. Should the Air Force find that some adjustments are needed to minimize impacts on the MTRs, appropriate steps (commensurate with mission requirements) will be taken.

4.2.2. Cumulative Impact

The cumulative noise impacts at Seymour Johnson AFB can be seen from the comparison of the 1986 baseline and proposed action data in Table 4.2-1.

The environment on and around any air installation is by nature subject to high levels of noise. A comparison of areas under the noise contours (Table 4.2-1) shows that the proposed action should increase the noise impact of flight operations on the Base and surrounding area at the higher decibel levels. As a result of the proposed action, the area exposed to noise levels of 65 DNL and greater will be increased by approximately 8700 acres. This increase could result in a higher number of neighboring inhabitants experiencing annoyance with the noise environment created by Base flight operations. However, in reality, the proposed action would be a return to the pre-1985 noise conditions (when 96 F-4 aircraft were assigned to the Base) in respect to total acreage impacted by aircraft noise.

The area exposed to 75 DNL or greater will increase by almost 1450 acres at Seymour Johnson AFB as a result of the proposed action over the no action alternative. The human inhabitants within the baseline 75 DNL contours include primarily Base personnel and some private residents near the Base. A greater number of off-Base residents will be affected by the increased 75 DNL contour (see Section 4.7). It is not expected that, in these cases, outside exposure to noise would approach the time durations (8 hours per day over a 40 year time span) that would result in long-term hearing damage. Peak noise levels from aircraft would be momentary and cumulatively would not approximate a continuous noise level for 8 hours a day. Likewise, it is not expected that an individual would remain in one location outdoors for a time period greater than 40 years.

The area between the 70 to 75 DNL contours would increase by about 6200 acres. At this noise level approximately 15 to 20 percent of the exposed population will be highly annoyed. As discussed in Section 3.2.6 while annoyance may be a stressor, there have been no definitive links established between long-term aircraft noise exposure and non-auditory health disorders. Negative public reaction to the increased noise level can be expected.

TABLE 4.2-3

COMPARISON OF NOISE LEVELS FOR SEYMOUR JOHNSON
MTRs AND UNDERLYING POPULATIONS SIZE

MTR	POPULATION[1]	PROPOSED ACTION DNL[2]
IR-012	63579	54
IR-721	246111	56
VR-058	219778	41
VR-073	45324	44
VR-096	181924	44
VR-1043	134207	43
VR-1046	74733	51
VR-1074	59866	49
VR-1752	260009	49
VR-1753	64974	50

1. From Table 3.7-14
2. From Table 4.2-2

Again these are short term changes (no action to proposed action). On a long term basis the proposed action would essentially represent a return to the 1985 conditions in respect to total acreage impacted by aircraft noise.

The Air Force discourages any new construction within the 75 DNL contour. It remains the responsibility of local communities to exercise prudence in urban planning so that future development is compatible with the operation of Seymour Johnson AFB. Ill-advised encroachment into the Base noise environment can pose a threat to the mission of Seymour Johnson AFB.

DCR is vital to the training mission of Seymour Johnson AFB. Range training exercises which include air-to-ground delivery of ordnance are by nature very noisy. Noise levels at the range at times may be high, but since the range is restricted, should not pose a threat to human health.

There will be a shifting of DCR operations from daytime to nighttime hours. A future consequence of this action may be that units from other bases (Langley, Shaw, Myrtle Beach) may fill the daytime range slots vacated by the 4th TFW. As a result, the total number of flights over the DCR could increase. The range noise level would increase accordingly; however, this change (16% in utilization) represents about half a decibel increase in noise.

Low intensity noise is expected along the designated low altitude training routes MTRs used by Seymour Johnson AFB aircraft (see Table 4.2-2). The overall DNL should see a slight decrease. Some route segments may see an increase in night-time low-level sorties but this increase is not expected to result in changing the projected DNL values by more than one decibel.

4.2.3. Unavoidable Adverse Impacts

The proposed action will result in an increase in after dark take-offs and landings at Seymour Johnson AFB. Noise may be more noticeable to local residents because of the fact that noise becomes a greater annoyance factor during the hours typically used for leisure. (See Table 3.2.-2 for comparison of F-4 and F-15 single event noise levels.) On a short term basis about 37% more acres will be impacted by noise; whereas, only 3% over the 1985 conditions.

The LANTIRN action will require increased nighttime use of the DCR. This will result in higher night-time noise levels. A number of surrounding areas that are used for outdoor recreation may be exposed to periodic low-level flyover of aircraft in transit to the range. This could cause temporary disruption of activities and annoyance; however, weekends, the most common time for outdoor recreation, should be free from aircraft noise interruption.
The continued use of the DCR will necessarily mean the continuation of the restriction of that area to human visitation.

Nighttime low-level sorties are an unavoidable but essential part of the LANTIRN program to properly train aircrews in low altitude nighttime navigation and weapons delivery. The level of annoyance on the MTRs will not materially

change.

4.2.4 Human Health Impacts

There should be no incremental human health impact from the change in the noise environment at the Base resulting from the proposed action.

The noise environment of the DCR has not been quantitatively defined. Frequent high-level noise events characterize the range. For this and other reasons the range remains restricted from public use.

4.3. Physical Environment Impacts

The proposed action will not have a significant impact on the non-biotic characteristics of Seymour Johnson AFB, DCR, Range BT-11, or land under Echo MOA and the proposed MTRs. Various facility modifications will be necessary to support the proposed action. These modifications include expanding paved areas and buildings at the Base. Construction will be limited and confined to presently developed areas. No major excavations or new wells are anticipated and there will be no change in present ground activities that would significantly affect the physical environment. The construction and maintenance of infrared targets at DCR would not adversely impact the physical environment of the range. The possibility of an accidental fire igniting the peaty ground of DCR is addressed in Section 4.4.

There will be no adverse impact on water resources as a result of the proposed action. The average family unit at Seymour Johnson AFB is 3.98 individuals (Jones, personal communication, 17 April 1987). Based on this family size, during 1985 approximately 2,786 individuals left the Base as the result of an F-4 squadron deactivation in 1985. The proposed action projects the addition of approximately 876 individuals, which represents a net decrease of 1,910 individuals as compared to the Base population before the 1985 F-4 squadron deactivation. The demand for water use at the Base will remain well below potential withdrawal rates and below past usage. Wastewater discharge rates for the Base will remain within the design capacity of the Goldsboro wastewater treatment plant.

In order to quantify the impact of the proposed beddown on generation of hazardous waste, three F-4 bases (George, Moody, and Seymour Johnson AFBs) and three F-15 bases (Holloman, Langley, and Tyndall AFBs) were surveyed for types and quantities of hazardous waste generated. The primary types of materials found included waste fuels and oils, paints, degreasers and strippers, and battery fluids. On average, the F-4 bases generated about 13 gallons per aircraft per month; whereas, the F-15 bases average about 17 gallons per aircraft per month. This level of increase is minor and is well within the capability of the base to manage. It is anticipated that the waste minimization program will continue to reduce the quantities of hazardous waste generated. Consequently, in the long run, there would be little, if any, real increase in quantity.

4.4. Biological Environment Impacts

4.4.1. Plant Communities

The proposed action will not have a significant impact on the existing plant communities of Seymour Johnson AFB. There will be no overall increase in the number of sorties per day. The areas that will be affected by proposed facility development previously have been developed or altered.

In considering the possible effects of air pollutants on the vegetation of DCR, BT-11, and on land under Echo MOA and the proposed MTRs, scientific evidence shows that:

- carbon monoxide (CO), a normal constituent of the plant environment, only affects vegetation when present in high concentrations;
- hydrocarbons (HC), except ethylene, do not affect vegetation adversely;
- particulate matter (PM) affects vegetation when present in high concentrations;
- oxides of nitrogen (NOx) and sulfur (SOx) may cause increased acidity in the environment and therefore adversely affect vegetation. However, the chemical reactions involved between the time of formation in the combustion process and when they have the potential to affect vegetation are complex and not fully understood. Oxides of nitrogen (NOx) in combination with SOx tend to increase the effects of air pollution beyond that expected for either pollutant alone. Their effects depend on the complex interaction of factors such as the species, time of day, amount of sunlight, state of maturity, type of injury, soil moisture, and the amount of nutrients available.

The manifestations of air pollution damage to vegetation can be seen in plant destruction, stunted growth, necrosis (killing of plant tissue), chlorosis (loss or reduction in plant chlorophyll), leaf abscission (dropping of leaves), and epinasty (downward curvature of the leaf).

During the years the DCR has been in use, vegetation has been subjected to air pollutants from:

- aircraft using the area;
- detonation of practice ordnance;
- application of herbicides for vegetation control; and
- controlled and uncontrolled burning of vegetation.

At the DCR where the vegetation has been subjected to exposure to the same type of activities for over 20 years, an inspection of vegetation (USAF, 1976) showed:

- no symptoms of mottling, surface bleaching, wilting, air pockets, or glazing on vegetation which might have been caused by exposure to NOx or its photochemical reaction products, ozone and peroxyacyl nitrates (PAN);
- no visible signs of retarded growth as might be caused by exposure to ethylene or high levels of carbon monoxide;
- no coating of plant surfaces which might have been caused by high levels of particulate matter (PM);
- some spotting of plants has been observed on the fringes of cleared areas apparently caused by drift from a herbicide application;

Continued observation of the vegetation at the DCR has not revealed any manifestations of air pollution damage. The proposed action would not change the overall scope of range use. The F-15E aircraft is cleaner than the F-4 with respect to air pollutant emissions. The projected changes in air pollutant concentrations expected from the proposed action should not impact vegetation on or adjacent to DCR or Range BT-11.

Another potential impact on the plant communities of the DCR and Range BT-11 is that which results from fire. Fire could be a consequence of a direct hit of the infrared targets by a practice shell and the ignition of fuel spilled onto the ground. Since a peaty ground cover exists at the DCR, a fire caused by the destruction of an infrared target could spread rapidly and may burn extensively beneath the surface and be difficult to extinguish.

There will be an overall decrease in F-15E airspace requirements for air combat training. Therefore, no adverse impact to the plant communities located on land area beneath the Echo MOA is expected. Those plant communities include agricultural crops such as tobacco, corn, soybeans, and wheat.

Results of air quality analysis (Section 4.1) indicate that no significant decrease in air quality is to be expected over the MTRs. Therefore, the use of the MTRs by the F-15E mission is not expected to impact the plant communities of land areas located beneath the MTRs. These plant communities include agricultural crops and forested lands such as national forests and other management areas.

4.4.2. Wildlife Communities

The proposed action is not expected to impact animal species at Seymour Johnson AFB. In the vicinity of Seymour Johnson AFB, previous development would have limited the wildlife to reptiles, amphibians, birds, and small mammals such as rodents. The overall noise environment at the Base will be increased as a

result of the proposed action (see Section 4.2). However, existing wildlife on or near the Base already are acclimated to living in a high noise environment and the changing noise environment should not significantly affect wildlife.

Several studies on the effects of noise on wildlife communities have been conducted. A variety of birds exhibit minimal response to loud noises (Lynch and Speare, 1978; Schreiber and Schreiber, 1980; Snyder, et al., 1978). Two studies (Platt, 1977, and Ellis, 1981) showed that nesting birds of prey responded to low-level jet overflights only when the aircraft were in sight.

Wildlife exposure to loud noises and sonic booms has been evaluated, but the studies mainly concern animals in captivity rather than in nature. Generally, the most sensitive behavior of animals is associated with reproductive periods. The impact of noise on reproduction has not been well documented. Most literature suggests that animals are little affected by jet aircraft noise; they appear to be more aware of moving objects than of sound. Animals apparently can undergo temporary threshold shifts when exposed to sound pressure levels of 70 to 90 dB to accommodate noise.

Research has been insufficient to test and confirm the hypothesis that animals are threatened by low flying aircraft. Existing data suggest that big game do not change their behavior appreciably, although they may show momentary concern to loud noise events. Panic reactions apparently are rare (BLM, 1981).

Avian species will occasionally run, fly, or crowd when exposed to sonic booms. In a field and laboratory study, Mourning Doves, Mockingbirds, Cardinals, Lark Sparrows, and quail were exposed to sonic booms or simulated boom overpressures to discover if booms were adversely affecting reproduction (Teer and Truett, 1973). Some differences in various phases of reproduction success were found between the control and test groups; however, none of the comparisons indicated the differences were caused by other than natural environmental factors. The laboratory test involved 7,425 incubated bird eggs which were carried through to hatching. Chicks hatched from these eggs were carried through to twelve weeks of age. Pressures of 2, 4, and 5.5 psf were delivered to the incubated eggs at three frequencies each day for 18 days. Results of these tests showed that the pressures had no effects on hatching success, growth rates, or mortality.

According to the U.S. Department of the Interior, Fish and Wildlife Service (USFWS), daylight, high-speed, low-level flights have a much greater chance of collision with birds than identical night flights. The precise effects of frequent low-level flights over nesting birds and on terrestrial mammals are not well known. Low-level flights could cause some of these species to abandon critical habitats and nesting areas if these habitats are directly under flight routes (USAF, 1985e). Shaw (1970) reported that adult Condors abandoned nests when disturbed by sonic booms. Bell (1970) and Henkin (1969) attributed mass hatching failures of Sooty Terns in Florida to the deleterious effects of sonic booms. Extremely low altitude supersonic flights over the nesting area may have driven the birds off the nests and damaged the uncovered eggs. Graham (1969) reported the destruction of pelican eggs by gulls when the pelicans were disturbed by sonic booms and left the nests. Reported scientific observations

and studies regarding the effects of low-level jet overflight on animals are not conclusive. There may be circumstances when it is prudent to avoid low-level overflight of wildlife or other animals. For example, a confined farm animal may injure itself or other animals if startled by any noise. However, the preponderance of information on this subject indicates that wildlife and farm animals do not suffer major or long-term adverse effects from low level military jet overflight (Shotton, 1982).

In summary, the available literature reviewed indicates that domesticated animals and wildlife are not adversely affected by the presence of military aircraft operations, both subsonic and supersonic, with possible exception that some animal species may be driven from critical habitats or nesting areas when such areas are located directly under low-level, supersonic, flight routes. At Nellis and other Air Force ranges where low-level and supersonic flights are being conducted, animals and wildlife have been exposed to sonic booms for over 25 years with no apparent significant effect. The proposed action does not include supersonic flights over land areas.

Wildlife has coexisted with the military uses of the Echo MOA, DCR, Range BT-11 and the MTRs for many years without any evidence of adverse affects on the quantity and diversity of wildlife. Noise analysis (Table 4.2-2) indicates that DNL in areas beneath the MTRs will either remain the same or decrease due to the proposed action. As a result, the anticipated noise levels that would result from the proposed action are not expected to have a negative impact on general wildlife communities. It is thus concluded that, while some individual animals may show an adverse response, animal populations as a whole should not be significantly impacted by the proposed action.

As previously stated, the potential for a fire caused by a direct hit on an infrared target exists for the range. If the area were destroyed by fire, a significant impact to the resident wildlife communities could occur directly from loss of life and/or indirectly because of habitat destruction.

4.4.3. Rare and Endangered Species

The projected changes in air pollutant concentrations from the proposed action are not expected to significantly affect air quality. Therefore, impacts to plant species of special concern, rare, or endangered are not expected to occur.

There are several examples of populations of endangered avian species that live in apparent harmony with long term exposure to low-level jet overflights (Shotton, 1982). The endangered Brown Pelican utilizes a mangrove swamp habitat on either side of the approach end of the main runway at MacDill Air Force Base, Florida. Fighter jet aircraft routinely pass about 300 to 800 feet above feeding or roosting Brown Pelicans, which exhibit no behavioral response to the overflights. Endangered Red-cockaded Woodpeckers (indigenous to the eastern North Carolina area) appear to be unaffected by frequent low-level jet overflight on the Eglin Air Force Reservation.

A study conducted by Ellis (1981) under cooperative agreement between the USFWS Fish and the Air Force for consultation on the Peregrine Falcon involved data gathering at 24 breeding sites of ten raptorial birds in an effort to record responses to low-level subsonic jets and mid- and high-altitude sonic booms. The study concluded that, "while the birds were often noticeably alarmed by the subject stimuli, the negative responses were brief and never productivity limiting. In general, the birds were incredibly tolerant of stimulus loads which would likely be unacceptable to humans." Ellis further states, "significantly, birds of prey of several genera commonly nest in the supersonic military operations areas in southern Arizona. In addition, raptor eyries are frequently found at locations where low-level jet traffic naturally concentrates." USFWS review of the Ellis study concluded that jet aircraft flights under 5,000 feet AGL and mid- to high-altitude (higher than 5,000 feet AGL) supersonic flight activity is not likely to jeopardize the continued existence of the Peregrine Falcon (USAF, 1985e).

The raptors studied by Ellis (1981) responded more to the sight of aircraft than to the sounds. Small nestlings did not respond to sight or sound. Large nestlings were alerted by aircraft greater than 984 feet (300m) away and alarmed by aircraft closer than 330 feet (100m). Adults were alerted and alarmed by aircraft at distances closer than 984 feet (300m). In no cases were eggs or nestlings dragged or kicked from nests by alarmed adults (USAF, 1985e).

The proposed action is not expected have a significant impact on the rare and endangered plant or animal species that could occur on Seymour Johnson AFB, DCR, Range BT-11, or under the Echo MOA, MTRs, or W-122 airspaces.

4.4.4. Sensitive Areas

The Neuse River and Stoney Creek are routinely monitored by Seymour Johnson AFB personnel to protect the biota and to preserve the habitat for the Neuse River Waterdog. The limited construction and modification in Base operations for the proposed action are not expected to impact these sensitive areas.

Significant impacts on the biota under Echo airspace are not expected from projected changes in air quality or noise. The F-15Es are cleaner aircraft than the F-4s and less noisy. Also, F-15E aircraft will use Echo MOA less than the baseline F-4 aircraft because of the F-15E LANTIRN mission emphasis on air-to-ground tactics. Visitors to Bentonville Battlefield and Laurel Lake Gardens should experience an overall decrease in noise from F-15E operations within Echo MOA because of the decrease in airspace utilization.

Increased nighttime sorties and low-level flights on the MTRs, DCR, and Range BT-11 are not expected to significantly impact wildlife communities on refuges in or near these areas, or within Cape Lookout and Cape Hatteras National Seashores. Increased nighttime sorties could initially affect the behavior of some nocturnal species who hunt or forage during the early evening hours.

4.4.5. Agricultural Resources

Farm and domestic animals have exhibited a variety of responses to aircraft noise. Dufour (1980) reported that milk cows, chicken eggs, and chicks were not affected after being subjected to jet-engine noise, although turkeys exhibited a temporary interruption of egg laying when exposed to jet-engine noise. He also reported that swine experienced temporary physiological responses to jet-engine noise but that feed utilization, rate of weight gain, food intake, and reproduction were not affected.

Moreover, Bell (1972) reported that domestic turkeys and chicken responded to loud noise bursts by running, flying and crowding. Both the North Carolina Departments of Agriculture and of Commerce have voiced concern over low-level military operations above populations of poultry because of the potential for injury and death. Shotton (1982) made a similar statement but added that farm animals do not suffer major or long-term adverse effects from low-level military jet overflights.

Projected changes in air quality are not expected to significantly affect vegetation including agricultural crops such as tobacco, corn, soybeans, and wheat. Therefore, significant adverse impacts to existing agricultural resources are not expected as a result of the proposed action. Although the land at the range is not or has not been used for agriculture, it could be used for that purpose after clearing, draining, and fertilization. Nothing in the proposed action would prevent future use of the land for agriculture.

4.4.6. Cumulative Impacts

The environmental effects of the proposed action are not expected to have a cumulative impact on the biological communities of the Seymour Johnson AFB, range, MTRs, Echo MOA, or surrounding environs. Any effects from construction at the Base or range would be temporary. Ground operations on the range are not expected to significantly differ from present levels. The frequency of night sorties will increase; however, wildlife on or near the various military operations areas already are accustomed to night operations. The range has been used intensively by the military for over 20-years and no cumulative adverse impacts have been observed.

4.4.7. Mitigative Measures

Mitigative measures to protect biological communities from adverse impacts due to the proposed action are not expected to be necessary at Seymour Johnson AFB or under the Echo airspace and MTRs. MTRs are designed to avoid populated areas and other noise-sensitive locations to the extent possible. Adherence to route widths and observance of special operating instructions to avoid noise-sensitive locations should minimize adverse noise impacts.

The potential for impact from a fire, caused by the bombing destruction of an infrared target on the DCR, can be minimized by placing the generator for the target in a container that would prevent fuel from spilling onto the ground.

Containers that could possibly be used are a concrete encasement or the stainless steel jet engine shipping containers.

4.4.8. Unavoidable Adverse Impacts

No significant adverse environmental impacts on biological communities are anticipated as a result of the proposed action.

4.5. Aircraft Accident Potential Impact

4.5.1. Impacts of Proposed Action

The proposed action will result in the total replacement of three squadrons of F-4Es by an equal number of F-15Es. The total number of sorties flown from Seymour Johnson AFB will not change appreciably as a result of the proposed action. However, the primary mission of the aircraft will change with the result that the number of night sorties will increase from the eight percent of total F-4E flights to 30 percent of the total F-15E sorties. The present 1200 F-4E night missions per year will be replaced by 4700 F-15E night sorties per year. The other impact upon aircraft accident potential in the vicinity of the airfield is that many more sorties will be single-ship or two-ship formations than have commonly been flown by the F-4Es.

Nighttime takeoffs and departures are usually during less congested periods of air traffic and all should be under instrument flight rules. Recoveries and landings at night also should be under strict air traffic control terminating in a Precision Approach [Ground Controlled Approach (GCA or Instrument Landing System (ILS)] straight-in landing. The proposed action also will involve fewer formation departures and recoveries which will reduce the potential for accidents. There has not been a single F-15 night accident (either Class A or Class B) in all of Tactical Air Command (TAC) during the previous five years (since 1981).

Even though the proposed action will result in an increase in night flying operations at Seymour Johnson AFB, there should be no significant impact on the probability of aircraft accident potential. Risks inherent to nighttime operations are expected to be offset by the benefits discussed above.

The proposed action will result in more extensive use of the DCR at night to accommodate the LANTIRN mission training requirements. Daytime utilization of the range by Seymour Johnson-based aircraft will not change appreciably.

The low-level, nighttime tactical interdiction role is new to the F-15 which previously has been used almost exclusively in the air-to-air role. The existing F-15 accident history does not include statistics on this new role; therefore, the potential for aircraft accidents on the range must be based on the F-4 history. The F-4 is also a two-seat, dual-role fighter and does have a substantial history in the surface attack role.

Another factor involved in accident potential is "bird-strike." The F-15E has a 200 knot, four pound bird screen capability, as does the F-4 which it will replace. The areas through which the F-15E will fly have substantial populations of turkey vultures. Since the aircraft will be flying at speeds in excess of 200 knots, and since the turkey vulture weighs more than four pounds, potential for bird strike exists. However, historical data for the F-4 aircraft suggests that this source of impact is minimal.

It is expected that the accident potential on the range will increase only slightly over the current potential. The higher accident potential is a result of the increased nighttime utilization of the range by a fighter adapting to a new role.

4.5.2. Cumulative Impacts

The cumulative impact of the proposed action on the aircraft accident potential at the Base will be minor. The night missions flown by the F-15s should result in slightly less congested daytime flying operations which should reduce the cumulative accident potential at the Base since the large majority of sorties and flying hours in the past resulted from day flights. The night missions will encounter less civil air traffic congestion and Seymour Johnson AFB departures and arrivals will all be under positive air traffic control. In summary, any increased aircraft accident potential attributable to the higher number of night F-15 flights should be offset by the factors discussed above.

The proposed action will increase the total number of range sorties at the Dare County Range by increasing the number of night range missions. Therefore, no impact is anticipated for the existing daytime range operations' accident potential. However, an increased night range utilization will result in a higher probability of an aircraft accident on the range complex.

4.5.3. Mitigative Measures

One of the concerns the North Carolina Department of Natural Resources and Community Development raised during the scoping process for this impact statement was the potential conflict in use of airspace near their aircraft operations for "firelighting" hunters and firefighting operations. The Air Force believes that the Federal Aviation Administration (FAA) has adopted adequate procedures for controlling flight operations in the airspace that is used by Seymour Johnson AFB. When operating under Visual Flight Rules, all aircraft must continually use the "see and avoid" rule. During times when there are forest fires, notice to airmen alerts of potential danger are issued through the FAA. Under such conditions, both civil and military aircraft not participating in the firefighting operations should avoid the hazard area. Any unique situations will be dealt with on a case-by-case basis.

4.5.4. Unavoidable Adverse Impacts

It is unavoidable that the proposed action will result in increased night flying operations. Night flying operations inherently involve a higher risk of aircraft accident; however, the increased safety precautions and operational procedures for night operations, as well as a reduction in daytime air traffic congestion as a consequence of the F-15E LANTIRN mission, effectively offset the inherent risks at the Base itself.

By increasing the number of night range sorties involved in undertaking a new tactical mission, there will be an unavoidable increase in the potential for aircraft accidents on the range. That potential cannot be quantified at this

time due to lack of statistics on F-15 night range missions and lack of defined training mission profiles.

4.6. Laser Operation Impacts

The LANTIRN Laser Designator/Ranger is a Q-switched, Neodymium doped Yttrium Aluminum Garnet (Nd:YAG) laser that will be capable of operating at two different wavelengths: operational mode (1064 nanometers) and training mode (1540 nanometers). The purpose of the LANTIRN laser system is to provide accurate range data to update the aircraft inertial navigation system and to designate targets for precision delivery of laser guided bombs. It is a modified version of the Pave Tack laser system currently employed by some of the aircraft that use the range. The optical bed components of the two systems are similar except that the LANTIRN laser uses updated technology to improve the stability of the resonator.

The LANTIRN laser will not be used on MTRs and in MOAs; it will only be used to lase targets on the range. The range targeting techniques will not materially change from those used for the Pave Tack laser system.

The absorption of laser radiation by living tissue can result in temporary or permanent damage to the tissue. Of primary concern are tissues of the skin and eyes. The extent and significance of injury depend upon the site irradiated, characteristics of the tissue, and characteristics of the incident radiation. The tissue characteristic of primary importance is the absorptive coefficient, i.e., ability to absorb radiation. Radiation characteristics of primary importance are wavelength, exposure duration, pulse width, repetition rate, and irradiance.

Tissue damage caused by absorption of laser radiation from low irradiance levels in the visible and infrared spectral region appears to be a result of increased tissue temperature. Laser radiation in the ultraviolet spectral region appears to cause damage primarily as a result of photochemical reactions. Effects on the skin from absorbed radiation may vary from mild erythema (redness) to blistering and/or charring, depending upon the total energy and rate at which it is absorbed. Radiation in the visible and near visible region has a more pronounced effect on the retina of the eye, whereas radiation from ultraviolet and infrared portions of the spectrum is more likely to produce damage to the cornea and lens.

The most serious retinal injury occurs if the eye is exposed to laser radiation is such a way that the incident energy is focused on the fovea. The ability to see detail, distinguish colors, and perceive depth is most highly developed in the fovea region, whereas the remainder of the retina is involved principally with the detection of low levels of light and motion. Injury in the peripheral region of the retina may not be apparent since visual acuity decreases rapidly with distance from the fovea. However, damage to the fovea can result in serious and immediate impairment of vision.

Air Force use of lasers is controlled by Air Force Occupational Health and Safety Standard 161-10, Health Hazards for Laser Radiation, and Air Force Regulation 50-46, Weapons Ranges, which addresses use of lasers on ranges. To protect range personnel and the environment, ranges are required to be certified

for each laser system that could be employed on the range. The Dare County Range has been certified for the Pave Tack and Pave Spike lasers for a number of years.

The U.S. Air Force Occupational and Environmental Health Laboratory at Brooks AFB, Texas, has reviewed the use of the LANTIRN laser on weapons ranges and concludes . . . " the 'operational' mode (1064 nanometer) presents laser hazards similar to previously fielded range finders and target designators like Pave Tack and Pave Spike and can be safely used on current laser ranges provided proper procedures and protective eyewear are utilized." (US Air Force, 1987) The Pave Tack and Pave Spike laser hazard safety zones are larger than that for the LANTIRN laser; thus, the former's control parameters would continue to be used to dictate required safety procedures.

While the LANTIRN laser's training mode appears to be "eye safe" under all conditions for unaided eye viewing, use of optics such as binoculars and telescopes to view the aircraft without the use of laser goggles of optical density 3.8 or greater could result in eye damage for the viewer. Considering this point, the Air Force plans to continue research and evaluation of the training mode capability but will not allow unrestricted use of the laser until the potential impacts are better defined and appropriate environmental documentation prepared. Use of the LANTIRN laser's training mode on approved ranges without eye protection is acceptable provided the aircraft is not viewed with optics. The Pave Spike and Pave Tack laser systems require optical density 4.0 laser goggles which will be adequate for the LANTIRN laser if optic viewing is required.

Considering that proper safety equipment and procedures already exist at the DCR, that the range's laser hazard safety zone would continue to be governed by the zone for Pave Tack and Pave Spike, and that the LANTIRN laser would not be used off range, it is concluded that no significant environmental impact would result from employment of the LANTIRN laser.

4.7 Socioeconomic Impacts

The alternate projections to 1991 embody assumptions regarding the proposed aircraft beddown at Seymour Johnson AFB. The manpower assumptions are shown in Table 4.7-1. The different pattern of staffing will mean a different pattern of socioeconomic impacts.

In addition to changes in manpower and equipment associated with the proposed program, Seymour Johnson AFB will experience an increase in construction activity. This activity will also result in positive economic impacts on the local economy, creating jobs and income.

The paragraphs below describe differences between the baseline projection and the projection that introduces the proposed project. This discussion is followed by one describing the impacts of noise on property values.

4.7.1 Income, Production, and Employment

By 1991, the proposed action will result in an increase of about 212 military personnel over the baseline estimate for that year. The number of civilian personnel will be higher by 28 persons. Total employment at Seymour Johnson AFB, including employment at non-appropriated fund services and the base exchange, will be greater by 233 persons, as shown in Table 4.7-1.

These differences suggest differences in the estimated wages and salaries paid to base personnel, and in operating expenses of the base. The total difference in direct wages and salaries is estimated at $4.5 million in 1991. The direct wage and salary impacts of the proposed action in earlier years may be seen in Table 4.7-2.

Direct production impacts total an estimated $174.8 million in the alternate projection for 1991, up $8.1 million from the baseline projection. The higher production estimates throughout the alternate projection reflect in part the construction program for the proposed action.

The proposed action will result in an increase of about $6.0 million in direct and indirect wages and salaries for Wayne County by 1991. These impacts will be spread primarily over local service industries.

Production impacts of the action on the county will total about $13.3 million in 1991. The 1991 estimate reflects a 4.3% increase over the estimated production impact of the baseline projection. The industries most affected are the construction industry, wholesale and retail trade, miscellaneous services, real estate and rental, and utilities.

Total employment in Wayne County will be higher by about 300 persons in 1991 as a consequence of the proposed action. Most of these jobs will be at Seymour Johnson AFB. Of the total increase about 67 jobs will be off the base and in the local community. These jobs will be primarily in service industries, particularly wholesale and retail trade, miscellaneous services, eating and

TABLE 4.7-1

DIFFERENCES IN MANPOWER AT SEYMOUR JOHNSON AFB
AS A RESULT OF THE PROPOSED ACTION

	1989	1990	1991
Military Personnel	70	142	212
Civilian Personnel	3	5	8
Base Exchange	1	3	4
Nonappropriated Fund	3	6	9
Total	77	156	233

TABLE 4.7-2

ECONOMIC IMPACTS OF THE PROPOSED ACTION

	1989	1990	1991
Direct Impact (Wayne County)			
Wages and Salaries ($M)	1.5	2.9	4.5
Production ($M)	4.2	6.1	8.1
Employment	77	156	233
Total Impact			
Wayne County			
Wages and Salaries	2.2	4.0	5.9
Production	6.6	9.8	13.2
Employment	110	206	300
North Carolina			
Wages and Salaries	2.3	4.2	6.2
Production	7.3	10.7	14.3
Employment	116	214	310
Total U.S.			
Wages and Salaries	3.3	5.6	8.0
Production	11.6	16.7	22.2
Employment	157	270	382

SOURCE: Data Resources, Inc. estimates.

drinking places, business services, finance and insurance, and personal services.

Incremental effects of the proposed action on North Carolina counties outside of Wayne County will be relatively small. Total wages and salaries will be greater by about $0.2 million, production greater by about $1.0 million and employment greater by about 10 jobs. The alternative projection estimates for North Carolina as a whole, for 1991, and their differences from baseline estimates are described below.

The total wage and salary impacts of Seymour Johnson AFB on the State of North Carolina will be $172.5 million in the alternate projection, up $6.2 million from the baseline estimate. In addition to the 1991 increment of $4.5 million paid to military and civilian personnel and other employees at Seymour Johnson AFB, North Carolina workers will enjoy an increment of about $1.7 million in total wages and salaries as a result of the proposed action. These incremental wages and salaries will be paid primarily by miscellaneous services and wholesale and retail trade.

About $14.3 million in incremental production by North Carolina industry will result by 1991 from the proposed action. This estimate includes $6.2 million in production not directly associated with Seymour Johnson AFB. The industries most affected include wholesale and retail trade, miscellaneous services, real estate and rental, utilities, and food and kindred products.

Employment effects follow suit. In addition to the 1991 increment of 233 base-related jobs due to the proposed action, an additional 77 jobs will be created within North Carolina industry. Over 60% of these jobs will be found in miscellaneous services, wholesale and retail trade, and eating and drinking places.

At the national level, impacts of the proposed action include increments of $8.0 million in wages and salaries, $22.2 million in production, and 382 jobs by 1991. About $1.8 million of the wage and salary increment, $7.9 million of the production impact, and 72 jobs occur in states other than North Carolina. Indirect and induced impacts at the national level (i.e., impacts other than those directly associated with the proposed action) include increments of $3.5 million in wages and salaries, $14.1 million in production, and 149 jobs. The main industries affected by the proposed action are transportation and warehousing, utilities, wholesale and retail trade, real estate and rental, business services, eating and drinking places, and miscellaneous services.

4.7.2 Effects of Noise on Residential Property Values

The following discussion concentrates on the near term condition (assuming no action would be taken to replace the F-4 squadron that was inactivated in 1985). While the impacts appear to be dramatic in respect to gross numbers, it must be realized that in reality, over the long term, the proposed action results in about a three (3) percent increase in acreage impacted by noise. Consequently,

the action would closely approximate conditions prior to the 1985 F-4 squadron inactivation However, until the full complement of F-15E's is activated, the impacts would be lessened.

There are properties which will experience reduced noise levels simultaneously with other properties which will experience increased noise levels. Table 4.7-3 shows the short term number of properties and structure characteristics experiencing reduced noise levels associated with the proposed action. Table 4.7-4 shows the short term number of properties and structure characteristics experiencing increased noise levels associated with the proposed action.

Tables 4.7-3 and 4.7-4 identify the residential properties affected by the change in AICUZ Compatible Use Districts (CUD) boundaries to those consistent with the proposed actions. In general, the shift in AICUZ boundaries will occur primarily over land currently vacant or employed in agricultural use. However, there will be a number of properties experiencing decreases as well as increases in noise. Properties to experience reduction in DNL are located in the South Goldsboro area, while those experiencing increased noise levels are located in the Brogden and New Hope Townships near the municipalities/towns of Mar-Mac, Brogden, Genoa, and Walnut Creek.

Table 4.7.3 indicates that approximately 1,258 residential properties will experience reduction in noise as the proposed actions shift properties from higher to lower level noise CUD area. A substantial number of properties located in the South Goldsboro area will actually shift out of the AICUZ entirely, reducing noise levels by 10 dB (DNL). Approximately 3,614 people will be affected by the reduced noise levels. The property values for single-family dwellings experiencing reduced noise levels range from $38,800 to $45,400 (1980) while rents range from $113 to $146 a month.

Table 4.7-4 states that approximately 2,416 residential properties will experience increases in noise levels ranging from 5-20 dB DNL. The majority of these properties are located in the Mar-Mac, Genoa, and Brogden areas. Additional properties are located in the Walnut-Creek area, as well as some properties located adjacent to Seymour Johnson AFB. The data in Table 4.7-4 indicates that approximately 6,855 people will be affected by the proposed action. Housing values range from $29,700 to $72,800, and contract rent prices range from $120 to $210 a month.

On the basis of studies of operating MOAs, the Air Force has reason to believe that operations on the MTRs and MOAs would not significantly affect the value of real property (Team Four, Inc., 1980) These studies examined the assessed valuation of property and the development of real estate in areas below the MOAs and there was no indication of a deterrence of real estate development.

Studies conducted during the 1960s - 1970s have addressed the effects of noise levels on properly values. These studies were reviewed by the Federal Aviation Administration (FAA, 1985) and concluded that "The bottom line is that noise has been shown to decrease the value of property by only a small amount... approximately one percent per decibel (DNL, above a level of DNL 55)...Because

TABLE 4.7-3

PROPERTIES EXPERIENCING REDUCED NOISE LEVELS
PROPOSED ACTION

AICUZ CUD*							
FROM	TO	Change in Noise dB (DNL)	Affected Units	Affected Population	Average Housing Value	Average Contract Rent	Geographic Area
12	13	-5	431	1,241	$45,400	$146	South Goldsboro
13	outside 13	-10	827	2,373	$38,800	$113	South Goldsboro

* Compatible Use Districts. See Section 3.7.1.3 for more information.

SOURCE: Analysis of Block Statistics, 1980 Census of Population and Housing, North Carolina

TABLE 4.7-4

PROPERTIES EXPERIENCING INCREASED NOISE LEVELS
UNDER PROPOSED ACTION

AICUZ CUD**							
FROM	TO	Change in Noise dB (DNL)	Affected Units	Affected Population	Average Housing Value	Average Contract Rent	Geographic Area*
13	13	5	225	592	$43,700	$144	Mar-Mac
outside AICUZ	13	15	878	2,466	$43,300	$160	Mar-Mac
13	7	10	219	574	$34,100	$137	Genoa
13	12	5	495	1,425	$39,800	$151	Brogden
outside AICUZ	12	20	452	1,356	$29,708	$155	Brogden
outside AICUZ	12	20	85	247	$72,800	$210	Walnut Creek
6	1	5	62	195	$49,800	N/A	Elroy

* Town or city area.
**Compatible Use Districts. See Section 3.7.1.3 for more information .

SOURCE: Analysis of Block Statistics, 1980 Census of Population and Housing, North Carolina.

there are many other factors that affect the price and desirability of a residence, the annoyance of aircraft noise remains just one of the considerations that affect the market value of a home."

It is not possible to determine the applicability of these studies to the proposed action. Experience of the Air Force at areas throughout the country does not support the application of this conclusion to areas near Air Force bases. However, some reductions in property value may occur as a result of the proposed action.

Any decline in property values would be experienced primarily by single family homeowners since the affected area has only residential property and agricultural land, and the value of the latter is not affected by slight changes in noise levels. Indeed, because agricultural uses will become relatively an even higher valued-use, values for agricultural land may improve, providing opportunities for increased wages to those workers living in areas who are employed in agricultural work.

Seymour Johnson AFB has been an established, active flying facility for several years. Most of the development now affected by aircraft noise has been construction with full knowledge of the existence of Seymour Johnson AFB. Property values in these areas, therefore, already reflect, to a great degree, valuation based on aircraft overflights, noise, crash potential, etc. Numerous factors affect the market value of a home, with noise being just one consideration. The Air Force experience at other military installations has not supported a loss of property value when a different type or larger number of aircraft has replaced existing aircraft. In fact, property values generally continue to increase because of greater employment and demand for housing; however, the rate of appreciation in value may be somewhat lower than that of nonaffected properties.

Property owners occasionally inquire about Air Force funded sound proofing programs that would help meet the AICUZ recommendations. The Air Force does not have a sound proofing program and has no authority to pay claims for decreases in property values. The United States pays only if the overflights and noise are so severe as to amount to a "taking" of an interest in the property. The interest taken is usually in the form of an easement, and the flights must be frequent, directly over the affected property, and below 500 feet.

Projected short term noise contours for the F-15 beddown are illustrative and should not be considered to represent absolute impact values. The projections are provided as a means for evaluating typical worst case conditions. Input data on aircraft operations, i.e. power, airspeed, climb and descent rates, etc. were extracted from AICUZ source data at bases that currently have F-15 type aircraft. This input data was used in conjunction with the existing F-4 flight tracks. Precise values for Seymour Johnson AFB can be obtained after the F-15E aircraft are on station and the pilots have an opportunity to adjust power, airspeeds and altitudes to achieve maximum noise reduction for the various flight tracks. On a long term basis there will be some minor differences in the noise contours from the 1983 AICUZ.

Seymour Johnson AFB will evaluate all flight tracks for the F-15E aircraft and a new AICUZ will be released to the public within 12 months of completing the beddown if new contours are warranted.

4.8. Archaeological Impacts

Because the consultation with the State Historical Preservation Officer indicated no known archaeological sites on Seymour Johnson AFB or the DCR, the proposed action is not expected to have any adverse impact on archaeological resources.

Many of the known archaeological sites under the MTRs are prehistoric with no above-ground remains. These buried artifacts would not be impacted by the proposed action, because there is little difference expected in the activity level for the MTR's. Structures within Echo MOA boundaries would not be affected because the minimum altitude for operations would remain at 7000 feet. Because overpressures from subsonic flights (0.5 psf) are much less than the overpressures required to cause structural damage (11.0 psf), and because supersonic flights, with their associated sonic booms, will not occur in the MOA or MTRs, significant impacts to standing structures of historical and archaeological significance are not expected to occur.

4.9. Aesthetic Impacts

Because of the industrial nature of the operations at Seymour Johnson AFB, the aesthetic values of the Base are unlikely to be adversely impacted by the proposed action.

The aesthetic quality of areas in the vicinity of DCR could be affected by the proposed action. The principal effect would be increased noise in the evening hours resulting from a greater number of early evening and nighttime sorties. However, the public frequently utilizing areas near DCR already should be accustomed to aircraft noise. Aesthetic quality of areas in the vicinity of the MTRs affected by the proposed action could also be affected by the increased number of evening and nighttime sorties. This might affect recreational activities, for example, in Cape Lookout and Cape Hatteras National Seashores (underlying VR-1043 and VR-73, respectively). Noise analysis for the MTRs affected by the proposed action (Table 4.2-2) indicates that DNLs will remain the same or decrease under the proposed action. As a result, no impacts to the recreational activities in areas underlying the affected MTRs are anticipated. In addition, LANTIRN sorties would utilize existing MTRs at currently approved altitudes. These routes are selected to avoid populated areas and MTR operating instructions specify noise sensitive locations. Therefore, strict adherence to route widths and operating instructions should serve to minimize any aesthetic impacts from noise.

5.0 CONSULTATION AND COORDINATION

5.0 CONSULTATION AND COORDINATION

During preparation of this Environmental Impact Statement, the Air Force contacted Federal, State, and local agencies, individuals and interest groups concerning the proposal to convert F-4 to F-15E aircraft. Communications ranged from formal written comments to informal contact.

Notice of Intent to prepare an Environmental Impact Statement was published in the Federal Register on November 13, 1987, and letters were mailed to local, state and Federal agencies. Letters were mailed to local individuals in the area of Seymour Johnson AFB, and coverage was provided in the local media concerning the proposal and the scoping meeting. A scoping meeting was held at the City Hall in the City of Goldsboro on December 19, 1987, with about 40 people attending.

This document is responsive to the pertinent comments raised during the scoping period that ran from November 13 through December 31, 1987.

6.0 LIST OF PREPARERS

6.0 LIST OF PREPARERS

Name Expertise/Discipline Role in Preparing EA	Experience
Mr. R. Morse Engineering/Civil Officer-in-Charge of EA	Over 11 yrs. experience as a program manager; project director for team which developed an independent estimate for the MX Missile Baseline Deployment; sr. cost manager with the responsibility for managing all cost efforts for the firm.
Mr. J. H. Stovall Engineering/Environmental and Civil Division Manager; project progress review; EA review	31 yrs. environmental engineering experience in industry and consulting engineering including: 7 yrs. experience project manager for environmental assessments for industrial projects costing up to $500,000,000; manager environmental department 4 yrs.; manager environmental division of 50 professionals/technicians for 2-1/2 yrs; presently Executive Vice President and Chief Operating Officer, Sirrine Environmental Consultants, Inc.
Mr. A. M. Kinghorn Engineering/Civil and Sanitary Staffing; final document review	8 yrs. environmental project engineer, J. E. Sirrine Co., 5 yrs. environmental department manager, CRS Sirrine, Inc. and Sirrine Environmental Consultants, Inc.
Mr. M. Madeley Engineering/Civil Project Manager; document control	2 yrs. civil/structural estimator, CRS Sirrine, Inc.; 4 yrs. project management in construction industry; 1 yr. structural design; 1 yr. project management, CRS Sirrine, Inc.
Dr. E. Zillioux Biology/Toxicology/Risk assessment Project Manager; environmental assessment of air quality and biological environments, aircraft accident potentials, laser operations, archaeology and aesthetics	12 yrs., ecological and oceanographic research, U.S. Naval Research Lab., National Marine Water Quality Lab., and Univ. of Miami; 2 yrs, regulatory science, Off. of Toxic Substances, USEPA; 10 yrs., ecological and toxicological consulting, Connell, Metcalf and Eddy, Environmental Assessment, Inc., Applied Biology, Inc., CRS Sirrine, Inc. and Sirrine Environmental Consultants, Inc.

LIST OF PREPARERS (Continued)

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Mr. G. Arrowood Technician Document control; graphics production	6 yrs. environmental department project designer; 7 yrs. piping designer, CRS Sirrine, Inc. and Sirrine Environmental Consultants, Inc.
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Mr. S. A. Daves Engineering/Environmental Physical impacts	2 yrs. design and structural review, S. C. Dept. of Hwys. and Public Transportation; 3 yrs. experience reviewing facility permit applications, engineering plans and sampling plans, evaluating compliance, sampling, and rendering guidance for hazardous waste facilities, S. C. Dept. of Health and Environmental Control; 1/2 yr. environmental engineering consulting, Sirrine Environmental Consultants, Inc.
Mr. E. L. Harris Engineering/Civil Air quality analysis	12 yrs. civil engineering experience including design of wastewater treatment plants and distribution systems, estimating, design, construction and upgrade of facilities for pulp and paper industry, design of ash disposal landfill, railroad layout, underground fire protection system, and entrance road and parking lot revisions, CRS Sirrine, Inc. and Sirrine Environmental Consultants, Inc.
Mr. E. B. Kaczmarczyk Meteorology/Air Pollution, Mathematics, Air Modeling, Data Processing Air quality analysis	2 yrs. project assistant, UW-Madison; 1-1/2 yrs. meteorologist, Wisconsin DNR; 1-1/2 yrs. staff meteorologist, North Carolina DEM; 7 yrs. staff meteorologist CRS Sirrine, Inc. and Sirrine Environmental Consultants, Inc.

LIST OF PREPARERS (Continued)

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Mr. L. W. Neal Biology/Ecology, Impact Assessment Environmental assessment; final document review	13 yrs. environmental consulting experience; aquatic and terrestrial ecosystem studies for USACOE, USEPA, US Geological Survey; USEPA EA/EIS preparation
Mr. D. M. Welch Engineering/Environmental Biological impacts	9 yrs. experience reviewing and inspecting potable water treatment and wastewater treatment facilities; conducting audits of industries to determine compliance with hazardous waste regulations, investigating ground water contamination problems, S. C. Dept. of Health and Environmental Control; 1 yr. environmental engineering consulting, CRS Sirrine, Inc. and Sirrine Environmental Consultants, Inc.
Dr. S. White Environmental Engineering Fighter Pilot/Instructor Pilot Aircraft accident potentials	5 yrs. fighter pilot, 200 combat missions, air combat instructor pilot; 11 yrs. consulting in environmental engineering pollution control
Mr. F. T. Arnold Economics Project Director; socioeconomic analysis	3 yrs. corporate officer DRI with responsibility for economic research in support of government clients. 3 yrs. DRI manager of defense economic research and applications. 8 yrs. senior regulatory experience with U.S. Environmental Protection Agency including economics and health research, expert testimony and Hearing Examiner
Mr. R. Doggett Economics Project Manager; economic Impact Analysis	7 yrs. economic impact analysis, DRI; 5 yrs. economic impact analysis, General Research, Corp.
Mr. T. S. Respess Economics Economic Impact Analysis; effect of noise on property values	3 yrs. defense economic analysis, DRI 3 yrs. energy market analysis, Penzoil

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APPENDICES

APPENDIX A

AIR QUALITY DATA

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TABLE A-1
FEDERAL AIR QUALITY DESIGNATIONS FOR NORTH CAROLINA

North Carolina—TSP

Designated area	Does not meet primary standards	Does not meet secondary standards	Cannot be classified	Better than national standards
Alamance County				X
Alexander County				X
Alleghany County				X
Anson County				X
Ashe County				X
Avery County				X
Beaufort County				X
Bertie County				X
Bladen County				X
Brunswick County				X
Buncombe County				X
Burke County				X
Cabarrus County				X
Caldwell County				X
Camden County				X
Carteret County				X
Caswell County				X
Catawba County				X
Chatham County				X
Cherokee County				X
Chowan County				X
Clay County				X
Cleveland County				X
Columbus County				X
Craven County				X
Cumberland County				X
Currituck County				X
Dare County				X
Davidson County				X
Davie County				X
Duplin County				X
Durham County				X
Edgecombe County				X
Forsyth County				X
Franklin County				X
Gaston County				X
Gates County				X
Graham County				X
Granville County				X
Greene County				X
Guilford County				X
Halifax County				X
Harnett County				X
Haywood County				X
Henderson County				X
Hertford County				X
Hoke County				X
Hyde County				X
Iredell County				X
Jackson County				X
Johnston County				X
Jones County				X
Lee County				X
Lenoir County				X
Lincoln County				X
McDowell County				X
Macon County				X
Madison County				X
Martin County				X
Mecklenburg County				X
Mitchell County				X
Montgomery County				X
Moore County				X
Nash County				X
New Hanover County				X
Northampton County				X
Onslow County				X
Orange County				X
Pamlico County				X
Pasquotank County				X
Pender County				X
Perquimans County				X
Person County				X
Pitt County				X
Polk County				X
Randolph County				X
Richmond County				X
Robeson County				X
Rockingham County				X
Rowan County				X
Rutherford County				X

TABLE A-1 (Continued)

North Carolina—TSP

Designated area	Does not meet primary standards	Does not meet secondary standards	Cannot be classified	Better than national standards
Sampson County				X
Scotland County				X
Stanly County				X
Stokes County				X
Surry County				X
Swain County				X
Transylvania County				X
Tyrrell County				X
Union County				X
Vance County				X
Wake County				X
Warren County				X
Washington County				X
Watauga County				X
Wayne County				X
Wilkes County				X
Wilson County				X
Yadkin County				X
Yancey County				X

North Carolina—SO_2

Designated area	Does not meet primary standards	Does not meet secondary standards	Cannot be classified	Better than national standards
Alamance County				X
Alexander County				X
Alleghany County				X
Anson County				X
Ashe County				X
Avery County				X
Beaufort County				X
Bertie County				X
Bladen County				X
Brunswick County				X
Buncombe County				X
Burke County				X
Cabarrus County				X
Caldwell County				X
Camden County				X
Carteret County				X
Caswell County				X
Catawba County				X
Chatham County				X
Cherokee County				X
Chowan County				X
Clay County				X
Cleveland County				X
Columbus County				X
Craven County				X
Cumberland County				X
Currituck County				X
Dare County				X
Davidson County				X
Davie County				X
Duplin County				X
Durham County				X
Edgecombe County				X
Forsyth County				X
Franklin County				X
Gaston County				X
Gates County				X
Graham County				X
Granville County				X
Greene County				X
Guilford County				X
Halifax County				X
Harnett County				X
Haywood County				X
Henderson County				X
Hertford County				X
Hoke County				X
Hyde County				X
Iredell County				X
Jackson County				X
Johnston County				X

TABLE A-1 (Continued)

North Carolina—SO_x

Designated area	Does not meet primary standards	Does not meet secondary standards	Cannot be classified	Better than national standards
Jones County				X
Lee County				X
Lenoir County				X
Lincoln County				X
McDowell County				X
Macon County				X
Madison County				X
Martin County				X
Mecklenburg County				X
Mitchell County				X
Montgomery County				X
Moore County				X
Nash County				X
New Hanover County				X
Northampton County				X
Onslow County				X
Orange County				X
Pamlico County				X
Pasquotank County				X
Pender County				X
Perquimans County				X
Person County				X
Pitt County				X
Polk County				X
Randolph County				X
Richmond County				X
Robeson County				X
Rockingham County				X
Rowan County				X
Rutherford County				X
Sampson County				X
Scotland County				X
Stanly County				X
Stokes County				X
Surry County				X
Swain County				X
Transylvania County				X
Tyrrell County				X
Union County				X
Vance County				X
Wake County				X
Warren County				X
Washington County				X
Watauga County				X
Wayne County				X
Wilkes County				X
Wilson County				X
Yadkin County				X
Yancey County				X

TABLE A-1 (Continued)

North Carolina—Ozone (O_3)

Designated area	Does not meet primary standards	Cannot be classified or better than national standards [1]
Mecklenburg County	X	
Rest of State		X

[1] Designations of "Cannot be classified or better than national standards" were reaffirmed on July 23, 1982.

North Carolina—CO

Designated area	Does not meet primary standards	Cannot be classified or better than national standards
Mecklenburg County	X	
Rest of State		X

North Carolina—NO_2

Designated area	Does not meet primary standards	Cannot be classified or better than national standards
Statewide		X

[43 FR 8964, Mar. 3, 1978, as amended at 43 FR 40430, Sept. 11, 1978; 44 FR 24846, Apr. 27, 1979; 44 FR 48680, Aug. 20, 1979; 46 FR 27934, May 22, 1981; 46 FR 36701, July 15, 1981; 46 FR 38508, July 28, 1981; 47 FR 31878, July 23, 1982]

Source: 40 CFR 81-334

APPENDIX B

NOISE

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TABLE B-1

GLOSSARY OF ACOUSTICAL TERMS

1. A-Weighted Sound Level (dBA)

A single number measure of a noise event. A-weighted sound pressure level is a sound pressure level which has been filtered or weighted to reduce the influence of the low and high frequency extremes in order to correlate better with human assessment of the loudness of sound.

2. Day-Night Average Sound Level (DNL)

A single number measure of community noise exposure. The day-night average sound level is obtained by energy-averaging noise levels over a 24 hour period, with a 10 db penalty to nighttime (10 p.m. to 7 a.m.) noise levels to account for increased annoyance due to noise during night hours.

3. Decibel

A unit measure of sound level.

4. Decibel Scale

A logarithmic measure of audible sound pressure levels dimensioned in decibel units. The hearing threshold of 20 u PA is the starting point, or zero on the decibel scale. One million times the hearing threshold level or 120 dB equates to the approximate threshold of pain.

5. Frequency

The number of sound wave oscillations per unit of time, usually measuring in Hertz (HZ), cycles per second.

6. Frequency Spectrum

The audible frequency range is 20 HZ to 2,000 HZ. These have been divided in eight octave bands 63, 125, 250, 600, 1000, 2000, 4000, and 8000 HZ.

7. Hearing Loss

Impairment of auditory sensitivity: an elevation of 2 hearing threshold level.

8. Hearing Threshold Level

The amount by which the threshold of hearing for an ear (or the average of a group) exceeds the standard audiometric reference zero.

TABLE B-1 (CONTINUED)

9. Impulse Noise

Noise of short duration (typically, less than one second) especially of high intensity, abrupt onset and rapid decay and often rapidly changing spectral composition.

10. Integrated Noise Model (INM)

A computer simulation which generates nosie contours based on average daily flight operations.

11. Noise

Sound that is perceived by humans to be annoying and unwanted.

12. Noise Contour

A curved line connecting places on a map representing a line of equal noise exposure. Noise exposure is expressed using the average day-night sound level, LDN, expressed in decibels.

13. Noise Hazard

Acoustic stimulation of the ear which is likely to produce noise induced permanent threshold shift in some of 2 population.

14. Noise-Induced Permanent Threshold Shift (NIPTS)

The minimum level at which a person can perceive sound permanently shifts to a higher level, a permanent hearing loss of some degree.

15. Noise Zone

Any area of land or water which is between two noise contour lines as designated by the LDN noise descriptor.

16. Sound

Any pressure variation or vibration transmitted through a medium such as air or water than can be detected by the human ear.

17. Sound Exposure Level (SEL)

A measure of the effect of duration and magnitude of a single noise event measured in A-weighted sound level above a specified threshold which is at least 10 dB below the maximum value.

TABLE B-1 (CONTINUED)

18. Sound Pressure Level

In decibels, 20 times the logarithm to base ten of the ratio of a sound pressure to the reference sound pressure. The reference for airborne sound in 20 micronewtons per square meter.

19. Temporary Threshold Shift (TTS)

A temporary shift in the minimum level of sound that human can perceive with 100 percent recovery to the pre-noise exposure hearing acuity usually afer a few hours. Also known as auditory fatigue.

TABLE B-2

Summary of Human Effects for Outdoor Day-Night Average Sound Level of 55 Decibels

Type of Effects	Magnitude of Effect
Speech - Indoors	No disturbance of speech 100 % sentence intelligibility (average) with a 5 dB margin of safety
- Outdoors	Slight disturbance of speech with: 100% sentence intelligibility (average) at 0.35 meter or 99% sentence intellibibility (average) at 1.0 meter or 95% sentence intelligibility (average) at 3.5 meters
Average Community Reaction	None; 7 dB below level of significant "*complaints and threats of legal action*" and at least 16 dB below "vigorous action" (attitudes and other non- acoustical factors may modify this effect)
High Annoyance	Depending on attitude and other non- acoustical factors, approximately 5% of the population will be highly annoyed.
Attitudes Toware Area	Noise essentially the least important of various factors

SOURCE: Guidelines for Preparing Environmental Impact Statements on Noise, Committee on Hearing Bioacoustics and Biomechanics, Assembly of Behavioral and Social Sciences, National Research Council, June 1977.

TABLE B-3

Summary of Human Effects for Outdoor Day-Night Average Sound Level of 65 Decibels

Type of Effects	Magnitude of Effect
Speech - Indoors	Slight disturbance of speech 99% sentence intelligibility (average) with a 4 dB margin of safety
- Outdoors	Significant disturbance of speech with 100% sentence intelligibility (average at 0.1 meter or 99% sentence intelligibility (average) at 0.35 meter or 95% sentence intelligibility (average) at 1.2 meters
Average Community Reaction	Significant; 3 dB above level of significant "complaints and threats of legal action" but at least 7 dB below "vigorous action" (attitudes and other non-acoustical factors may modify this effect
High Annoyance	Depending on attitude and other non-acoustical factors, approximately 15 percent of the population will be highly annoyed.
Attitudes Towards Area	Noise is one of the most important adverse aspects of the community

TABLE B-4

Summary of Human Effects for Outdoor Day-Night Aveage Sound Level of 75 Decibels

Type of Effects	Magnitude of Effect
Speech - Indoors	Some disturbance of speech Sentence intelligibility (average) less than 99%
- Outdoors	Very significant disturbance of speech with: 100 sentence intelligibility not possible at any distance or 99% sentence intelligibility (average) at 0.1 meter or 95% sentence intelligibility (average) at 0.35 meter
Average Community Reaction	Very severe; 13 dB above level of significant "complaints and threats of legal action" and at least 3 dB above "vigorous action" (attitudes and other non-acoustical factors may modify this effect)
High Annoyance	Depending on attitude and other non-acoustical factors, approximately 37% of the population will be highly annoyed.
Attitudes Towards Area	Noise is likely to be the most important of all adverse aspects of the community

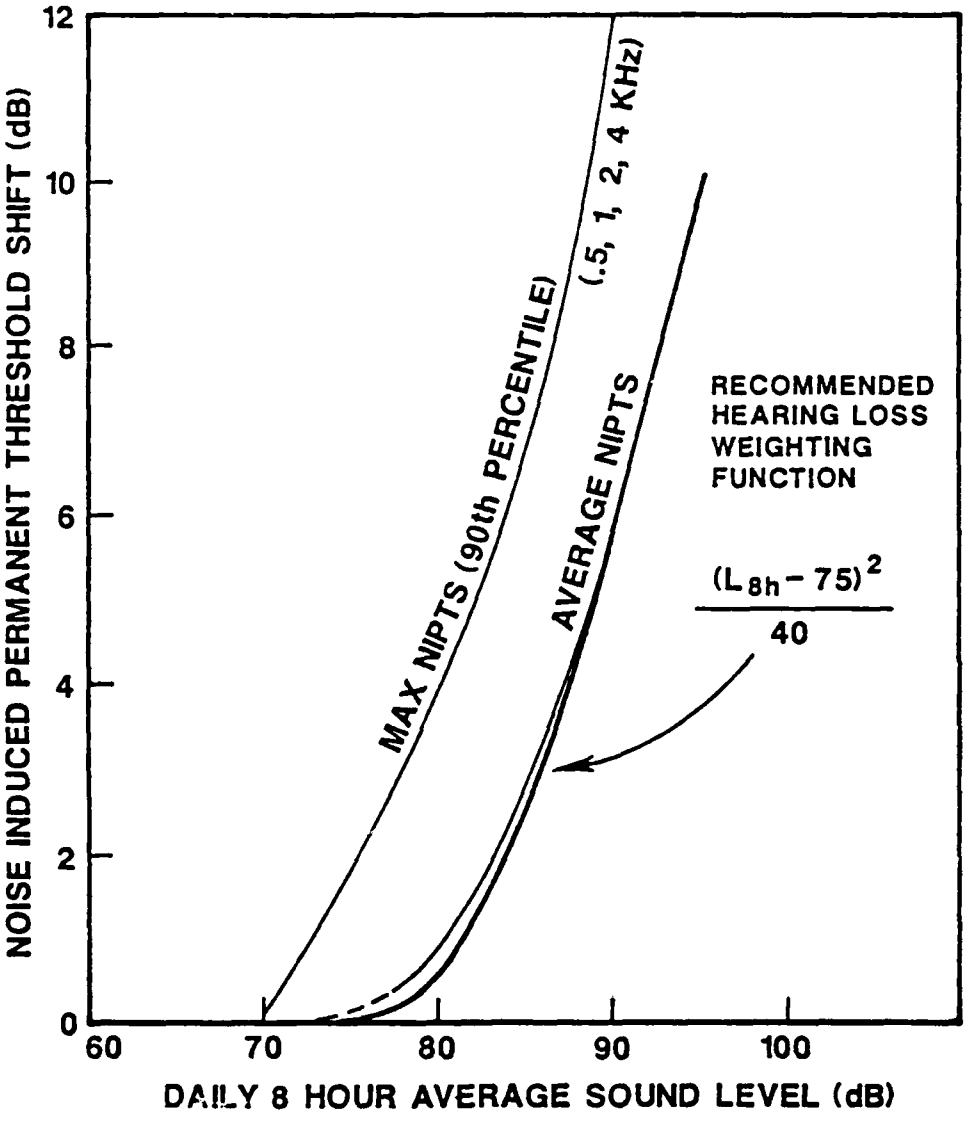

Figure B-1 Potential hearing damage risk for daily exposure to 8 hour average sound levels. The curves predict noise induced permanent threshold shift (NIPTS) in octave bands (.5, 1, 2, 4 kHz) for 8-hour exposure at various continuous noise levels. The eight hour average sound level can be replaced by DNL with negligible error if a person spends the remaining 16 hours out of 24 in L_{eq} of 70 dB or lower.

Source: Guidelines for Preparing Environmental Impact Statements on Noise, Committee on Hearing Bioacoustics and Biomechanics, Assembly of Behavioral and Social Sciences, National Research Council, June 1977.

APPENDIX C

PHYSICAL AND BIOLOGICAL DATA

CONTENTS

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Table C-1	Fish and Wildlife Habitat Summation	C-1

TABLE C-1

FISH AND WILDLIFE HABITAT SUMMATION

Wildlife Habitat (By Cover Type)	Acreage	Featured Species (Associated Species)	Featured Species Acreage	Population Estimate
Shrub pocosin	12,829	Marsh rabbit (deer, quail, prarie warbler, bobcat, bear)	7,336	1/7 acre
Cane pocosin	2,863	Red-cockaded woodpecker (deer, quail, bobcat, marsh rabbit, bear)	2,863	1 colony
Low Tree pocosin	8,782	Deer (marsh rabbit, prarie warbler, bobcat, bear)	8,782	1/70 acre
Medium/high tree pocosin	2,943	Deer (pine warbler, bear, bobcat)	2,631	1/70 acre
Mixed pine/hardwood swamp	6,080	Bear (deer, racoon, woodduck, barred owl, pileated woodpecker, Swainson's warbler)	6,080	1/4000 acre
Hardwood swamp	9,329	Bear (deer, racoon, woodduck, pileated woodpecker, prothonotary warbler)	9,329	1/4000 acre
White Cedar	1,813	Bear (pileated woodpecker, blackthroated green warbler	1,813	1/4000 acre

continued next page

TABLE C-1

(Continued)

Wildlife Habitat (By Cover Type)	Acreage	Featured Species (Associated Species)	Featured Species Acreage	Population Estimate
Disturbed	1,496	Deer (marsh rabbit, bear)	1,496	1/40 acre
Streams/Canals	10*	Otter (yellow perch)	10*	1 to 3/4 stream mile
Freshwater Lakes				
Whipping Creek	328	Alligator/(yellow perch)	328	Unknown
Black Lake	135	Yellow bullhead	135	Unknown

*This is stream acres; no figures are available at present on the acres of canals present.

APPENDIX D

AIRCRAFT EMISSION CALCULATIONS

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D.1 General

The estimate of air pollution concentrations from aircraft emissions requires a two-step analysis:

- Emissions from the various aircraft modes passing through the base, MTR, and range airspace must be quantified. The amount of emissions, in turn, determines the quantity of pollution released into the atmosphere and can thus be dispersed.

- A dispersion analysis must be performed which determines resulting air pollution concentrations from the aircraft emissions. Teh dispersion analysis indicates the atmospheres ability to transport and dilute the air pollution emissions. This is done via EPA approved modeling techniques.

First, aircraft emissions are estimated using emission factors and flight operational data. Some emission factors are engine type, fuel burned, and operational mode (Scott and Naugle, 1978). This, in turn, can give emission factors in terms of number of sorties by aircraft type and operational mode. Combining the operational data (number of sorties and modes) with the emission factors allows the estimation of aircraft emissions. In addition, the number of sorties for each aircraft type is broken into the type of flight (i.e., transition, low altitude, etc.); the power settings for the mode of operation were assumed as follows:

- Air Combat Maneuvers - Intermediate

- Low Altitude - Intermediate

D.2 Engine Emission Measurements

Accurate emission data are required for analysis of the air pollutant emissions from aircraft engines. For this reason, the Air Force conducted a three-year engine emission survey from 1975 through 1977 (Table D-1, Ref. 1). The most common Air Force engines were sampled using advanced turbine engine emission measurement techniques. These emissions data are the most current and accurate available.

Table D-1 contains emission indices for F-15 aircraft. Careful attention should be given to the references from which the emissions data were obtained. The Scott Environmental Technology emissions measurement data are accurate to ±15 percent of the reported data (Table D-1, Ref. 1). All other emissions data are extracted from other reports; no specific accuracy limits can be assigned to these emissions indices.

Almost all carbon monoxide (CO), total hydrocarbon (C_xH_x) and oxides of nitrogen (NO_x) emissions were measured using procedures described in the Society of Automotive Engineers Aerospace Recommended Practice 1265. The Particulate (PM) emissions were derived from SAE Smoke Numbers (SNs). The SNs were converted to mass per unit volume (Table D-1, Ref. 2). The particulates mass rates in Table D-1 were calculated using the mass per unit volume results, engine operating characteristics and mass balance. Sulfur emissions were calculated assuming complete oxidation of fuel sulfur to sulfur dioxide and the average percentage of sulfur in the fuel (Table D-1, Ref. 3).

Afterburning engines in Table D-1 (except the J-85) use extrapolated data based on J-79 afterburner emissions data and the actual engine AB fuel flow rates (Table D-1, Ref.4).

The aircraft emissions factors in Table D-1 are expressed in units of pollutant mass per 1000 mass units of fuel consumed, e.g., pounds per thousand pounds or grams per kilograms. The emissions factors and fuel flows are given for each engine mode. The engine thrust modes listed are the primary modes used by an aircraft during Landing and Takeoff (LTO) and Touch and go (TGO) cycles.

Emissions can be calculated for any engine mode using the aircraft emission indices in Table D-1. Engine Mode (EGM), Time in NMode (TIMOD) and Number of Engines (EMFAC) are the only parameters required to calculate emissions. The Engine Mode Fuel Flow (FLFLW) and Emission Factor (EMFAC) are obtained from Table D-1. Emissions for the F-15 are shown in Table D-2.

TABLE D-1

USAF AIRCRAFT ENGINE EMISSION FACTORS

Engine (Aircraft)	Engine Mode	Fuel Flow kg/s	Fuel Flow 1000 lbs/hr	Pollutant Emission Rate (u/kg fuel or lbs/1000 lbs fuel)* Carbon Monoxide	Unburned Hydrocarbons	Oxides of Nitrogen	Total Particulates[1]
F-100-P-100	Idle[1]	0.179[1]	1.417[1]	24.0[1]	3.2[1]	3.3[1]	0.12[1,2]
(F-15)	Approach[3]	0.378[4]	3.000[4]	5.8[3]	1.9[3]	6.7[3]	0.27[2,3]
(F-16)	Approach[3]	0.378[4]	3.000[4]	5.8[3]	1.9[3]	6.7[3]	0.27[2,3]
	Intermed[1]	0.643[1]	5.106[1]	1.6[1]	0.1[1]	9.8[1]	0.47[1 2]
	Military[1]	1.301[1]	10.325[1]	0.9[1]	0.1[1]	27.0[1]	0.34[1;2]
	AB[5]	5.797[5]	46.010[5]	4.0[6]	0.01[6]	3.1[6]	0.15[6]
J85-GE-5	Idle[1]	0.057[1]	0.453	178.0[1]	30.0[1]	1.3[1]	0.003[1,2]
(F-5)	Approach[1]	0.126[4]	1.000[4]	73.6[3]	6.4[3]	1.8[3]	0.007[2,3]
(T-38)	Approach[3]	0.126[4]	1.462[7]	43.0[3]	3.5[3]	2.3[3]	0.011[2,3]
	Intermed[1]	0.284[1]	1.463[1]	43.0[1]	3.5[1]	2.3[3]	0.011[1]
	Military[1]	0.331[1]	2.630[1]	29.0[1]	0.8[1]	2.6[1]	0.018[1]
	AB[6]	1.049[1]	8.323[1]	26.0[6]	0.07[6]	2.0[6]	0.008[6]
TF34-GE-2	Idle[1]	0.049[1]	0.390[1]	106.0[1]	32.0[1]	2.0[1]	0.04[1,2]
(A-10)	Approach[3]	0.157[4]	1.250[4]	8.3[3]	0.6[3]	5.8[3]	0.02[2,3]
	Intermed[1]	0.186[1]	1.473[1]	4.3[1]	0.2[1]	7.5[1]	0.01[1,2]
	Military[1]	0.323[1]	2.562[1]	2.3[1]	0.1[1]	10.0[1]	0.05[1,2]

Continued next page

TABLE D-1 (CONTINUED)

SOURCE: Scott, H. A., Jr. and D. F. Naugle. 1978. Aircraft Air Pollution Emission Estimation Techniques - ACEE. Final report August 1977-August 1978. Civil and Environmental Engineering Development Office. Tyndall AFB, Florida

*Average sulfur emissions are 1.0 g/kg fuel for turbine engines using JP-4 fuel and 0.6 g/kg fuel for piston engines using "aviation gasoline."

1. Souza, A. F. and Daley, P. S., USAF Turbine Engine Emission Survey. CEEDO-TR-78-34, September 1978.

2. Particulate mass flow rate calculations.

3. Approach engine emissions were calculated by a power curve interpolation method using engien mode fuel flows and emission indices.

4. Mahler, Lt. Col., HQ TAC/DOV, trip report containing approach aircraft fuel flows gy Lt. P. D. Music (Det 1 ADTC) dated 15 August 1977.

5. Souza, A. F., F-100 Afterburner Turbine Engine Emission Test Report. CEEDO-TR-78-54, September 1978.

6. "Developement of Emissions Measurement Techniques for Afterburning Turbine Engines." AFAPL-TR-75-52. October 1975. All engine's afterburner emissions use the J79-G15 reactive plume emissions indices from AFPL-TR-75-52.

7. Peterson, Lt. Col. Roy W., HQ ATC/DOV, letter report containing aircraft engine approach mode fuel flows dated 3 August 1977.

TABLE D-2

F-15 AIRCRAFT EMISSIONS

Operation	CO	HC	NOx	PM	SOx
Startup	3.86E-03	5.14E-04	5.30E-04	1.93E-05	1.61E-04
Taxi Out	3.24E-03	4.32E-04	4.45E-04	1.62E-05	1.35E-04
Engine Check	1.76E-05	1.95E-06	5.27E-04	6.63E-06	1.95E-05
Runway Roll	5.57E-04	1.39E-06	4.33E-04	2.09E-05	1.39E-04
Climb 1	9.19E-04	2.30E-06	7.15E-04	3.45E-05	2.30E-04
Climb 2	4.12E-05	4.58E-06	1.24E-03	1.56E-05	4.58E-05
Approach 1	2.79E-04	9.15E-05	3.23E-04	1.30E-05	4.82E-05
Approach 2	1.62E-04	5.30E-05	1.87E-04	7.54E-06	2.79E-05
Landing	5.86E-04	7.81E-05	8.06E-05	2.93E-06	2.44E-05
Taxi In	3.14E-03	4.19E-04	4.32E-04	1.57E-05	1.31E-04
Shutdown	1.29E-04	1.71E-05	1.77E-05	6.43E-07	5.36E-06
Total	1.3E-02	1.6E-03	4.9E-03	1.5E-04	9.7E-04
Touch + Go	1.4E-03	1.5E-04	2.6E-03	7.3E-05	3.6E-04

Source: Scott, H.A., Jr. and D. F. Naugle. 1978. Aircraft Air Pollution Emission Estimation Techniques - ACEE. Final report August 1977-August 1978. Civil and Environmental Engineering Development Office. Tyndall AFB, Florida.